W. B. No. 1202 Issued June 2, 1937

UNITED STATES DEPARTMENT OF AGRICULTURE
WEATHER BUREAU

MONTHLY WEATHER REVIEW

[Supplement No. 36]

WINDS IN THE UPPER TROPOSPHERE AND LOWER STRATOSPHERE OVER THE UNITED STATES

By LOYD A. STEVENS
Aerological Division, Weather Bureau, Washington, D. C.

Submitted for Publication February 23, 1937

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1937

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - - - - - - - - - Price 40 cents

WEATHER REVIEW
MONTHLY

WINDS IN THE UPPER TROPOSPHERE AND LOWER STRATOSPHERE OVER THE UNITED STATES

By Loyd A. Stevens

Aerological Division, U. S. Weather Bureau, Washington, D. C., January 1937]

INTRODUCTION

Due to the increasing interest of aeronautical engineers, meteorologists, and others in the possible advantage of high-altitude flying, it is deemed appropriate to publish at this time the results of wind measurements made by the United States Weather Bureau during the past several years for altitudes between 6 and 14 kilometers (20,000 to 46,000 feet, approximately) above sea level. A summary of the winds in the lower levels over the eastern section of the United States was published in the Monthly Weather Review Supplement No. 35, and another summary for the central and western sections of the country will be published in a similar manner in the near future. For the information of those interested in the other elements in the free air, reference is also made to another publication soon to be issued as a supplement to the Monthly Weather Review, entitled "Summary of Aerological Observations Obtained by Means of Kites, Airplanes, and Sounding Balloons in the United States". Data are given herein for 30 stations, shown in table 1, which were selected according to their geographical location and number of observations available for high altitudes.

Table 1.—*List of stations showing elevation above sea level, period of record, and number of daily observations*

Station	Elevation	Period of record	Number of daily observations
	Meters		
Amarillo, Tex.	1,117	May 1932–Feb. 1936	4
Boise, Idaho	850	Dec. 1926–Dec. 1935	3
Broken Arrow, Okla.	233	Oct. 1918–June 1933	2
Brownsville, Tex.	12	Aug. 1929–Feb. 1936	3
Burlington, Vt.	132	Jan. 1920–Aug. 1935	2
Cheyenne, Wyo.	1,873	Sept. 1926–Nov. 1935	3
Due West, S. C.	217	Dec. 1920–May 1932	2
Ellendale, N. Dak.	444	Oct. 1918–Feb. 1932	2
El Paso, Tex.	1,196	Apr. 1932–Dec. 1935	3
Evansville, Ind.	124	Oct. 1929–Feb. 1936	4
Greensboro, N. C.	271	May 1928–Feb. 1936	3
Groesbeck, Tex.	139	Oct. 1918–May 1931	2
Havre, Mont.	762	Aug. 1927–July 1935	2
Jacksonville, Fla.	14	Oct. 1926–July 1935	2
Key West, Fla.	11	July 1920–Jan. 1936	2
Lansing, Mich.	263	June 1919–Oct. 1926	1
Los Angeles, Calif.	217	Sept. 1925–Dec. 1935	3
Madison, Wis.	307	May 1919–Feb. 1927	1
Memphis, Tenn.	145	July 1923–July 1935	2
Modena, Utah.	1,665	Aug. 1927–Dec. 1935	2
New Orleans, La.	25	Oct. 1926–Feb. 1936	2
Omaha, Nebr.	321	Jan. 1919–Sept. 1935	3
Portland, Oreg.	24	July 1928–Oct. 1935	3
Redding, Calif.	223	Apr. 1929–Feb. 1936	4
Royal Center, Ind.	225	Oct. 1918–Mar. 1932	2
San Francisco, Calif.	8	June 1921–Nov. 1935	3
Sault Ste. Marie, Mich.	198	Nov. 1926–Feb. 1936	2
Sheridan, Wyo.	1,153	Aug. 1927–June 1934	2
Washington, D. C.	10	Jan. 1919–July 1935	3
Winslow, Ariz.	1,488	Dec. 1931–Jan. 1936	4

Since the data are rather meager for these altitudes at most stations, the summarized results for each level are shown only for the four seasons and for the year as a whole. Summarized data are not shown for any season or level having less than 15 observations. This minimum number is believed to be too small, in most cases, to give true seasonal averages but was decided upon in order that, for the purpose of comparison, the graphical representation might be as complete as possible and the tabular matter reduced to a minimum. Data for seasons having less than 15 observations are shown in tabular form, each individual wind observation being listed separately.

Table 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*

AMARILLO, TEX.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter					SE.	13		
Spring					W.	5		
Summer							E.	6
Do							E.	7
Do							ESE.	13
Do							ESE.	7
Do							SSE.	8
Do							SSW.	7
Do							WSW.	11
Do							WSW.	7
Do							WSW.	12
Do							WSW.	13
Do							NW.	2
Do							NNW.	27
Autumn							WNW.	13

BOISE, IDAHO

Winter					SW.	8		
Do					SW.	10		
Do					WNW.	13		
Do					WNW.	12		
Do					NW.	16		
Do					NNW.	9		
Spring							N.	5
Do							N.	16
Do							SSE.	29
Summer							ENE.	11
Do							WSW.	21
Do							WSW.	30
Autumn							NNE.	13
Do							ESE.	21
Do							WSW.	8
Do							W.	23
Do							WNW.	23

BROKEN ARROW, OKLA.

Winter							SSW.	2
Do							SW.	17
Do							WSW.	36
Do							W.	24
Do							W.	32
Do							W.	26
Do							W.	25
Do							W.	34
Do							WNW.	17
Do							NW.	27
Do							NW.	30
Spring							WSW.	10
Do							W.	19
Do							WNW.	13
Do							WNW.	21

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*—Contd.

BROWNSVILLE, TEX.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter			SW.	22				
Do			WSW.	18				
Do			W.	54				
Do			W.	18				
Do			W.	22				
Do			WNW.	24				
Spring			SW.	6	WSW.	12	SW.	23
Do			WSW.	8	WSW.	12		
Do			W.	25	W.	17		
Do			W.	15	NW.	30		
Do			W.	14				
Do			WNW.	21				
Do			NW.	9				
Do			NW.	28				
Summer							E.	6
Do							E.	22
Do							SE.	12
Autumn					N.	9		
Do					N.	20		
Do					SW.	19		
Do					W.	4		
Do					W.	10		
Do					W.	9		
Do					W.	25		
Do					WNW.	2		
Do					WNW.	7		
Do					NW.	8		
Do					NW.	7		
Do					NW.	13		
Do					NW.	12		
Do					NNW.	3		

BURLINGTON, VT.

Winter	N.	24	SSW.	10	WSW.	16		
Do	N.	5	SW.	4	NW.	21		
Do	NNE.	7	SW.	14				
Do	SSW.	8	W.	12				
Do	SSW.	7	W.	13				
Do	SW.	3	WNW.	13				
Do	WSW.	2	NW.	19				
Do	W.	13						
Do	W.	9						
Do	WNW.	19						
Do	WNW.	12						
Do	WNW.	37						
Do	WNW.	12						
Do	WNW.	10						
Spring			SSE.	8	S.	8	W.	16
Do			SW.	6	WSW.	19		
Do			WSW.	11	W.	8		
Do			W.	16				
Do			WNW.	17				
Do			WNW.	17				
Do			WNW.	10				
Do			WNW.	4				
Do			NW.	15				
Do			NW.	7				
Summer					N.	10		
Do					ENE.	16		
Do					ESE.	7		
Do					WSW.	20		
Do					W.	32		
Do					WNW.	7		
Do					WNW.	6		
Do					NNW.	9		
Autumn					N.	35	NW.	32
Do					NE.	8	SE.	12
Do					SW.	11		
Do					WSW.	19		
Do					WSW.	18		
Do					W.	14		
Do					W.	18		
Do					WNW.	15		
Do					WNW.	12		
Do					WNW.	4		
Do					NW.	12		

CHEYENNE, WYO.

Winter					SSW.	5		
Do					WSW.	17		
Do					W.	12		
Spring					NE.	14	ESE.	25
Do					ESE.	11	WNW.	25
Do					SE.	2		
Do					S.	27		
Do					SSW.	19		
Do					WSW.	17		
Do					W.	15		
Do					WNW.	14		
Do					WNW.	16		

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*—Contd.

CHEYENNE, WYO.—Continued

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Spring					NW.	28		
Do					NNW.	17		
Autumn							N.	3
Do							N.	3
Do							S.	6
Do							WSW.	3
Do							NW.	6
Do							WNW.	9
Do							WNW.	9

DUE WEST, S. C.

Winter					W.	24		
Do					W.	42		
Do					WNW.	30		
Do					NW.	31		
Do					NNW.	8		
Spring							SW.	19
Do							NNW.	6
Autumn							N.	5
Do							NNE.	13
Do							ESE.	6
Do							SSE.	3
Do							WSW.	15
Do							WSW.	19
Do							W.	24
Do							WNW.	8
Do							WNW.	9
Do							NNW.	5

ELLENDALE, N. DAK.

Winter					W.	18	NW.	17
Do					WNW.	21		
Do					WNW.	15		
Do					NW.	15		
Do					NW.	10		
Do					NNW.	12		
Spring							N.	9
Do							NE.	27
Do							WSW.	12
Do							WNW.	12
Summer							NNE.	15
Do							WSW.	19
Do							WSW.	11
Do							WSW.	22
Do							W.	8
Do							W.	10
Do							W.	10
Do							W.	15
Do							W.	19
Do							WNW.	10
Do							WNW.	18
Do							WNW.	24
Do							NW.	11
Do							NNW.	9
Autumn							N.	14
Do							WSW.	12
Do							W.	3
Do							W.	10
Do							WNW.	19
Do							NW.	9

EL PASO, TEX.

Winter					N.	15	W.	20
Do					NNE.	44		
Do					ENE.	10		
Do					ENE.	15		
Do					E.	8		
Do					SW.	10		
Do					WSW.	28		
Do					W.	22		
Do					W.	16		
Do					W.	13		
Do					WNW.	9		
Do					NW.	11		
Do					NW.	8		
Do					NNW.	12		
Spring					NNE.	4		
Do					SSE.	3		
Do					SW.	18		
Do					WSW.	17		
Do					W.	11		
Do					W.	31		
Do					W.	25		
Do					WNW.	18		
Do					WNW.	25		
Do					WNW.	40		

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*—Contd.

EVANSVILLE, IND.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter	WNW.	20						
Do	WNW.	25						
Do	NNW.	9						
Spring							SW.	10
Do							WNW.	17
Summer					N.	16	NE.	2
Do					NE.	3	SW.	4
Do					SSW.	8	WSW.	8
Do					SW.	9	W.	16
Do					WSW.	6	NW.	12
Do					W.	13	NW.	10
Do					W.	13		
Do					W.	11		
Do					WNW.	3		
Do					WNW.	14		
Do					NNW.	8		
Do					NNW.	12		
Do					NNW.	12		
Autumn					N.	15	E.	29
Do					N.	3	WSW.	8
Do					NE.	7	WSW.	46
Do					NE.	19	NW.	31
Do					E.	12		
Do					WSW.	1		
Do					WSW.	26		
Do					WSW.	25		
Do					W.	7		
Do					WNW.	17		
Do					NW.	30		
Do					NW.	24		

GREENSBORO, N. C.

Winter	N.	35	NNE.	50	WSW.	18		
Do	N.	10	WSW.	22				
Do	NNE.	12						
Do	WSW.	21						
Do	WSW.	7						
Do	WSW.	24						
Do	WSW.	17						
Do	W.	19						
Do	W.	7						
Do	WNW.	22						
Do	WNW.	36						
Do	WNW.	24						
Do	NW.	11						
Do	NNW.	18						
Spring							S.	12
Do							W.	38
Do							WNW.	11
Do							NW.	23
Do							NW.	14
Do							NNW.	8
Do							NNW.	12
Autumn							N.	12
Do							W.	7
Do							WNW.	8
Do							NW.	17
Do							NNW.	14

GROESBECK, TEX.

Winter							WNW.	24
Do							WNW.	9
Spring							S.	6
Do							SSW.	9
Do							W.	14
Do							W.	20

HAVRE, MONT.

Winter					ENE.	20		
Do					SSE.	2		
Do					SSW.	5		
Spring					N.	6	W.	6
Do					N.	10		
Do					SSW.	10		
Do					SW.	24		
Do					WSW.	6		
Do					W.	10		
Do					WNW.	6		
Do					NW.	5		
Summer							NW.	14
Autumn							WNW.	11
Do							W.	10

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*—Contd.

JACKSONVILLE, FLA.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter			NE.	12	WNW.	9		
Do			WNW.	9				
Do			WNW.	21				
Do			WNW.	22				
Do			NW.	8				
Do			NW.	18				
Do			NNW.	21				
Spring							N.	16
Do							NNE.	22
Do							WSW.	10
Do							NW.	10
Autumn							NE.	11
Do							S.	16
Do							SSW.	17
Do							SW.	26
Do							WSW.	7
Do							WNW.	12
Do							NNW.	9

KEY WEST, FLA.

Winter							SW.	21
Do							SW.	9
Do							W.	34
Do							W.	28
Spring							SE.	12
Do							WNW.	6

LANSING, MICH.

Winter	NE.	4	N.	4	ENE.	10		
Do	WNW.	26	WNW.	15	WNW.	9		
Do	WNW.	27	NW.	27				
Do	WNW.	26	NNW.	12				
Do	WNW.	18						
Do	WNW.	21						
Do	NW.	28						
Do	NW.	6						
Do	NW.	15						
Do	NNW.	13						
Spring					N.	29	WSW.	19
Do					N.	10	NW.	18
Do					WSW.	7	NW.	14
Do					W.	8	NW.	12
Do					WNW.	7		
Do					WNW.	29		
Do					NW.	27		
Do					NW.	5		
Do					NW.	7		
Do					NNW.	8		
Do					NNW.	13		
Summer							S.	24
Do							WNW.	7
Autumn							N.	6
Do							N.	22
Do							WNW.	18
Do							WNW.	27
Do							NW.	24

LOS ANGELES, CALIF.

Winter					SW.	5	WSW.	6
Do					SW.	2		
Do					WSW.	20		
Do					W.	6		
Do					WNW.	20		
Do					NW.	6		
Do					NW.	14		
Spring					NE.	5	WSW.	15
Do					ESE.	4	WSW.	9
Do					SW.	8		
Do					WSW.	10		
Do					WSW.	17		
Do					W.	11		
Do					W.	7		
Do					WNW.	18		
Do					WNW.	12		
Do					NNW.	6		
Summer							S.	6
Do							SSW.	5
Do							WSW.	12
Do							W.	19
Autumn							NNE.	24
Do							W.	10
Do							WNW.	8
Do							NW.	11
Do							NNW.	3

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*—Contd.

MADISON, WIS.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter			S.	16				
Do			W.	4				
Do			W.	26				
Do			W.	16				
Do			NNW.	5				
Spring			N.	8	NNE.	13	E.	16
Do			N.	9	ENE.	12	WSW.	11
Do			NE.	15	W.	14	NW.	20
Do			E.	2	W.	39		
Do			SW.	15	W.	8		
Do			W.	15	WNW.	16		
Do			W.	20	WNW.	13		
Do			W.	12	NW.	16		
Do			WNW.	13				
Do			NW.	24				
Do			NW.	38				
Do			NW.	15				
Do			NNW.	9				
Do			NNW.	16				
Summer					N.	9	N.	15
Do					N.	13	S.	7
Do					NE.	10	NW.	10
Do					NE.	7		
Do					E.	8		
Do					S.	6		
Do					NW.	12		
Do					NNW.	7		
Autumn					ENE.	16	SSE.	14
Do					ESE.	4		

MEMPHIS, TENN.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter	NNE.	5	N.	8	WSW.	18	N.	11
Do	NE.	17	WNW.	13	NNW.	11		
Do	WSW.	24	WNW.	13				
Do	WSW.	28						
Do	W.	11						
Do	WNW.	15						
Do	NW.	25						
Spring			NNE.	13	NNE.	13	N.	6
Do			NNE.	1	W.	15	NE.	22
Do			ENE.	8	NW.	7		
Do			WSW.	15	NNW.	15		
Do			WNW.	20				
Do			WNW.	20				
Do			WNW.	9				
Do			NW.	18				
Do			NNW.	11				
Summer							N.	11
Do							SSE.	5
Do							W.	14
Autumn					S.	8		
Do					WSW.	16		
Do					W.	8		
Do					W.	4		
Do					W.	7		
Do					W.	31		
Do					W.	11		
Do					WNW.	4		
Do					NW.	13		
Do					NNW.	22		

MODENA, UTAH

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter					NE.	7	W.	33
Do					ENE.	18		
Do					WSW.	20		
Do					WSW.	13		
Do					W.	19		
Do					WNW.	11		
Do					NW.	6		
Do					NW.	22		
Spring					N.	7	S.	29
Do					NE.	8	NW.	18
Do					SSW.	8	NNW.	11
Do					SSW.	10		
Do					WSW.	22		
Do					WSW.	4		
Do					W.	11		
Do					W.	13		
Do					W.	8		
Do					W.	16		
Do					WNW.	11		
Do					NW.	14		
Summer					NNE.	15	N.	20
Do					S.	11	NNW.	13
Do					WSW.	5		
Do					W.	32		
Do					NW.	31		
Do					NW.	12		
Autumn							NNE.	18
Do							ESE.	12
Do							ESE.	42
Do							ESE.	21
Do							SSE.	20
Do							SSE.	9
Do							S.	23

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*—Contd.

NEW ORLEANS, LA.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter			W.	13	WNW.	10	WNW.	16
Do			W.	11	WNW.	26		
Do			W.	36				
Do			WNW.	20				
Do			WNW.	8				
Spring					NNE.	17	NE.	9
Do					ENE.	6	WNW.	43
Do					W.	31	NW.	30
Do					W.	28		
Do					W.	21		
Do					W.	13		
Do					W.	20		
Do					WNW.	22		
Do					WNW.	19		
Do					NW.	20		
Summer					W.	21		
Do					W.	22		
Do					W.	19		
Do					WNW.	9		
Do					NW.	9		
Do					NNW.	20		
Autumn							WSW.	28
Do							WSW.	34
Do							W.	28
Do							W.	32

OMAHA, NEBR.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter					S.	3	W.	14
Do					SW.	9	W.	21
Do					W.	15	WNW.	20
Do					W.	11	WNW.	15
Do					W.	14	WNW.	15
Do					WNW.	19	WNW.	19
Do					WNW.	14		
Do					WNW.	20		
Do					WNW.	20		
Do					NW.	15		
Do					NW.	43		
Spring					NNE.	16	N.	17
Do					WSW.	13	W.	41
Do					W.	35		
Do					WNW.	17		
Do					WNW.	14		
Do					NW.	13		
Do					NNW.	14		
Autumn							N.	23
Do							N.	18
Do							N.	17
Do							NNE.	21
Do							W.	16
Do							W.	23
Do							W.	23
Do							WNW.	6
Do							NW.	3
Do							NNW.	17

PORTLAND, OREG.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter					SSE.	1	N.	1
Do					SSW.	4	ENE.	12
Do					SW.	12	SSW.	12
Do					WSW.	9	WSW.	15
Do					WSW.	2		
Do					W.	36		
Do					NNW.	20		
Spring							SW.	18
Do							WSW.	14
Do							WNW.	9
Summer							SW.	9
Do							SW.	12
Do							SW.	23
Do							WSW.	7
Do							W.	18
Do							WNW.	26
Do							NNW.	5
Autumn							N.	24
Do							WNW.	11
Do							WNW.	13
Do							WNW.	17
Do							NNW.	21

REDDING, CALIF.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter							NNE.	16
Do							W.	15
Do							NNW.	19
Spring							S.	9
Do							SW.	11
Do							WSW.	3
Do							NW.	15

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*—Contd.

REDDING, CALIF.—continued

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Summer							SW.	5
Do							SW.	17
Do							SW.	15
Do							SW.	16
Do							SW.	8
Do							SW.	6
Do							SW.	15
Do							SW.	16
Do							WSW.	6
Do							WSW.	10
Do							NW.	20
Do							NNW.	11
Autumn							ENE.	16
Do							SSE.	10
Do							WSW.	12
Do							WSW.	19
Do							W.	12
Do							W.	22
Do							WNW.	27
Do							NW.	8
Do							NW.	12
Do							NW.	15
Do							NNW.	20
Do							NNW.	14
Do							NNW.	5

ROYAL CENTER, IND.

Winter			W.	19	WNW.	21		
Do			W.	24				
Do			WNW.	20				
Do			NW.	23				
Do			NW.	22				
Do			NW.	19				
Do			NNW.	46				
Spring							W.	10
Do							W.	11
Do							NNW.	8
Do							NW.	28
Summer							NNE.	17
Do							NE.	14
Do							ENE.	5
Do							ENE.	14
Do							ENE.	12
Do							NW.	7
Do							NNW.	12
Autumn							NE.	2
Do							SE.	10
Do							W.	3
Do							NW.	20
Do							NW.	4
Do							NNW.	6

SAN FRANCISCO, CALIF.

Winter					N.	14	N.	16
Do					N.	11	WNW.	24
Do					SSW.	9		
Do					WSW.	16		
Do					W.	1		
Do					WNW.	24		
Do					WNW.	17		
Do					WNW.	8		
Do					WNW.	14		
Do					NW.	24		
Do					NW.	17		
Do					NNW.	15		
Spring					NNE.	10	W.	11
Do					SSW.	4		
Do					WSW.	15		
Do					W.	16		
Do					W.	7		
Summer							SE.	1
Do							SSW.	13
Do							SSW.	11
Do							WSW.	20
Do							W.	17

SAULT STE. MARIE, MICH.

Winter	N.	15	N.	14				
Do	N.	21	E.	6				
Do	ENE.	1	W.	20				
Do	ESE.	3	NW.	4				
Do	SE.	7						
Do	W.	14						
Do	WNW.	6						
Do	WNW.	28						
Do	NNW.	26						
Spring					NNE.	12	W.	8
Do					WSW.	17		
Do					WSW.	13		
Do					W.	45		
Do					W.	10		
Do					W.	7		
Do					WNW.	11		
Do					WNW.	8		
Do					NW.	10		
Do					NW.	9		
Do					NW.	26		
Do					NNW.	18		

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*—Contd.

SAULT STE. MARIE, MICH.—continued

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Summer							N.	1
Do							NNE.	7
Do							NE.	6
Do							SW.	6
Do							WSW.	13
Do							WNW.	21
Do							NW	31
Do							NW.	24
Autumn			NE.	28	S.	3	SW.	3
Do			WSW.	9	W.	12	NW.	45
Do			W.	12	WNW.	9		
Do			W.	26	WNW.	16		
Do			WNW.	13	NW.	23		
Do			NW.	13				
Do			NW.	15				
Do			NW.	2				
Do			NNW.	28				
Do			Calm.	0				

SHERIDAN, WYO.

Winter					ESE.	23	NW.	71
Do					S.	5	WNW.	1
Do					W.	19		
Do					NW.	15		
Do					NW.	22		
Do					NNW.	29		
Do					NNW.	13		
Spring							ENE.	13
Do							SSE.	28
Do							SSW.	22
Do							W.	19
Summer							NNE.	14
Do							NE.	14
Do							NW.	5
Autumn							SSW.	7
Do							WNW.	10
Do							WNW.	34

WASHINGTON, D. C.

Winter	NE.	23	W.	23				
Do	W.	12	W.	21				
Do	W.	15	WNW.	29				
Do	W.	25	WNW.	41				
Do	W.	7						
Do	WNW.	19						
Do	WNW.	19						
Do	WNW.	34						
Do	WNW.	27						
Do	WNW.	12						
Do	NNW.	20						
Spring					NNE.	14	WNW.	9
Do					ESE.	6		
Do					S.	8		
Do					SW.	15		
Do					WSW.	9		
Do					W.	18		
Do					W.	21		
Do					NW.	10		
Summer							NNE.	13
Do							SE.	10
Autumn							NW.	6
Do							NW.	13
Do							NNW.	16

WINSLOW, ARIZ.

Winter							N.	28
Do							NNE.	28
Do							SW.	16
Do							W.	13
Do							W.	16
Do							WNW.	12
Do							WNW.	10
Do							WNW.	25
Do							WNW.	25
Do							NNW.	23
Spring					N.	15	WSW.	22
Do					NNE.	18	NNW.	12
Do					WSW.	27		
Do					WSW.	18		
Do					WSW.	13		
Do					W.	30		
Do					NW.	14		
Do					NW.	18		
Do					NW.	9		
Summer							ESE.	9
Do							ESE.	17
Do							S.	4
Do							S.	29
Do							SW.	6
Do							SW.	16
Do							WSW.	8
Do							W.	24
Do							W.	12
Do							W.	15
Autumn							ESE.	5
Do							WSW.	20
Do							WSW.	16
Do							W.	28
Do							W.	20

As for the reliability of these data, it should be pointed out here that most of the observations were based on the single theodolite method, wherein the ascensional rate of the balloon is *assumed* rather than measured; also, that pilot-balloon observations are not made when precipitation is falling or low clouds prevail. It is essential, furthermore, that relatively low velocities prevail in the lower levels in order that observations may reach the high levels, for high velocities in the lower levels cause the balloons to be carried out at such low angles that they are usually lost from sight before reaching great heights. In general, however, it is believed that these data are quite representative of average wind conditions, especially for the first three levels of 6, 8, and 10 kilometers, corresponding approximately to 20,000, 26,000, and 33,000 feet, respectively. For the higher levels, also, certain stations have sufficient data to show fairly reliable averages. Wind directions referred to herein always indicate the direction *from* which the wind blows. All velocities are given in meters per second, with the English measure equivalents indicated where appropriate.

This summary consists of (1) wind roses, (2) resultant winds, (3) average velocities, (4) frequency of high velocities, and (5) extreme velocities. Wind roses and resultant winds are given in graphical form on the accompanying charts.

WIND ROSES

In figures 1–23, wind roses are shown for each of the 5 levels 6, 8, 10, 12, and 14 kilometers for the four seasons and for the year, insofar as sufficient data are available. It will be noted that, for the year as a whole, the prevailing directions are, for the most part, between WSW. and NW. at all levels, although there is an apparent shift to N. or NE. in the higher levels over the southeastern part of the country. The latter is probably due to the fact that most of the observations reaching these levels at these stations were made during the summer and autumn months when, in general, easterly directions are more prevalent. The greatest variation from the yearly average occurs during the summer season when the northward movement of the belt of northeast trade winds causes a decided increase in the frequency of easterly winds and a marked decrease in velocities south of about latitude 35°. There is also greater variation in direction at all stations during this season. In general, the average velocities are highest from the prevailing directions and higher in winter than in summer; the difference in velocities between winter and summer being greatest in the more southern latitudes. For the year as a whole, there is an increase in velocity with height up to a level varying from about 14 kilometers over the extreme south portion of the country to about 10 kilometers over the extreme north portion. This limiting level—above which, *on the average*, velocities do not increase—corresponds closely to the average height of the tropopause over these latitudes. During the winter season, however, when the tropopause is lowest, the increase in velocity does not extend even to the 8-kilometer level over the northern part of the Rocky Mountain and western Plateau regions. This may be due to the fact that balloons are more likely to be observed to high levels, during this season, when relatively low velocities prevail at all levels; or, it may be due to the fact that this region lies in the path of frequent outbreaks of polar air masses from western Canada, which bring with them the characteristic conditions (including a low tropopause) of the more northern latitudes. In general, also, there is an increase in velocity with latitude. This is more pronounced in summer than in winter and more pronounced at 6 kilometers than at higher levels, becoming less at each successive level above 6 kilometers. During the winter season, however, highest velocities appear to occur over the east-central part of the country at all levels.

In table 3 the annual percentage frequencies of the winds from all directions are combined into four figures showing the total frequency from each of the four cardinal directions. In arriving at these figures, the total frequencies of winds from NNW., N., and NNE., and ½ (NW. plus NE.) were grouped as N.; the total frequencies of ENE., E., ESE., and ½ (NE. plus SE.) were grouped as E., the total frequencies of SSE., S., SSW., and ½ (SE. plus SW.) were grouped as S., and the total frequencies of WSW., W., WNW., and ½ (SW. plus NW.) were grouped as W.

TABLE 3.—*Annual percentage frequency of wind directions from each of the 4 quadrants: North winds include NNW., N., NNE., and ½ (NW.+NE.); east winds include ENE., E., ESE., and ½ (NE.+SE.); south winds include SSE., S., SSW., and ½ (SE.+SW.), and west winds include WSW., W., WNW., and ½ (SW.+NW.)*

AMARILLO, TEX.

Quadrant	6 km	8 km	10 km	12 km	14 km
N.	27	28	27	17	----
E.	10	13	15	15	----
S.	13	13	17	21	----
W.	50	46	41	47	----

BOISE, IDAHO

N.	21	23	27	19	----
E.	6	6	11	10	----
S.	17	16	13	17	----
W.	56	55	49	54	----

BROKEN ARROW, OKLA.

N.	28	30	33	28	24
E.	7	10	11	10	15
S.	11	10	8	10	8
W.	54	50	48	52	53

BROWNSVILLE, TEX.

N.	23	25	31	25	----
E.	20	18	15	16	----
S.	13	11	10	8	----
W.	44	45	43	51	----

BURLINGTON, VT.

N.	26	33	27	18	----
E.	5	6	1	10	----
S.	8	6	14	6	----
W.	61	55	57	66	----

CHEYENNE, WYO.

N.	21	25	28	26	----
E.	4	7	10	11	----
S.	12	9	12	18	----
W.	63	59	50	45	----

DUE WEST, S. C.

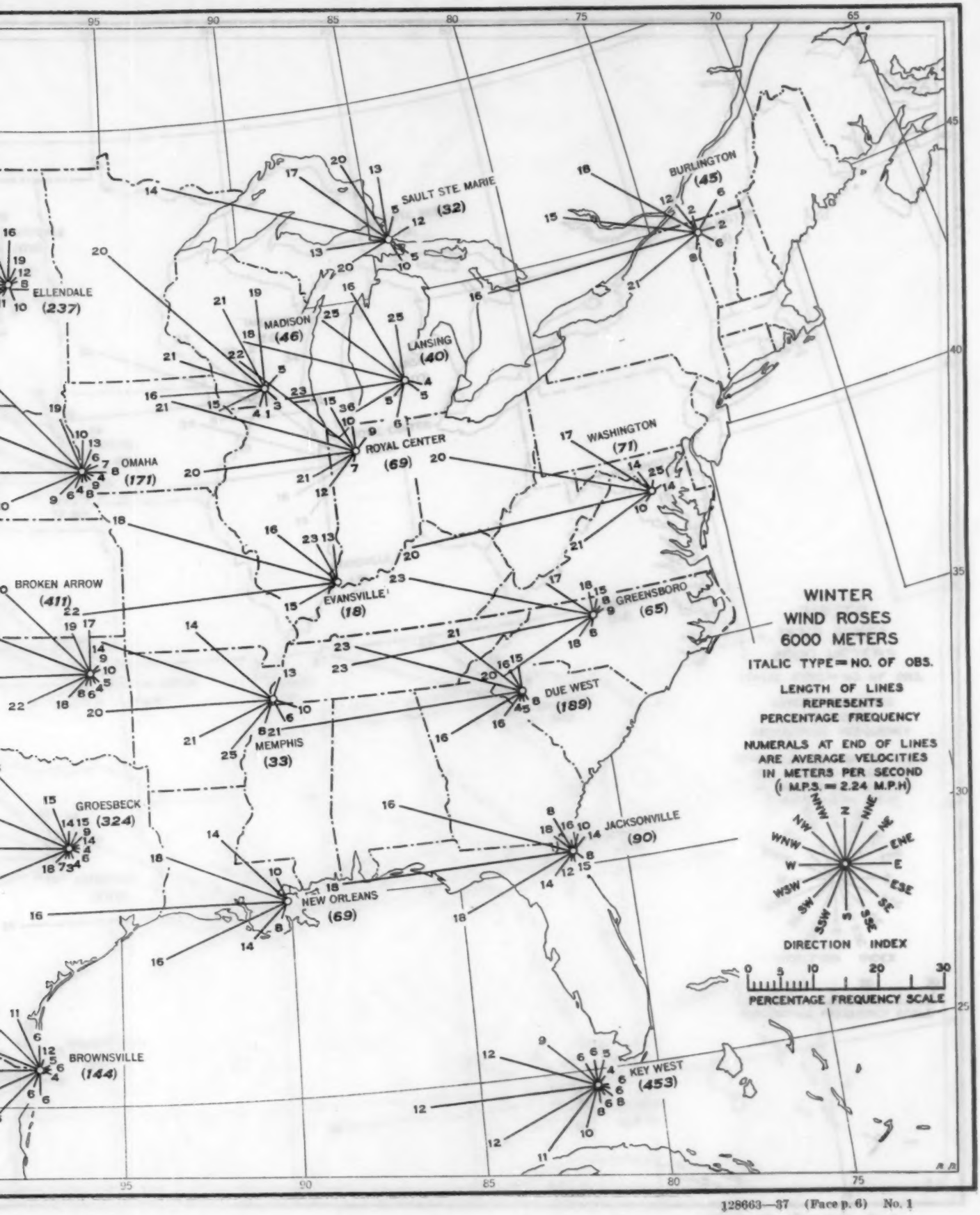
N.	21	24	26	35	33
E.	9	9	12	18	25
S.	8	7	10	5	14
W.	62	60	52	42	28

ELLENDALE, N. DAK.

N.	27	30	32	32	24
E.	4	5	5	3	2
S.	5	7	5	3	0
W.	64	58	58	62	74


PORTLAND (106)
HAVRE (102)
BOISE (212)
SHERIDAN (238)
ELLENDA (237)
REDDING (444)
CHEYENNE (386)
SAN FRANCISCO (190)
MODENA (448)
BROKEN AR (411)
LOS ANGELES (129)
WINSLOW (852)
AMARILLO (255)
EL PASO (232)

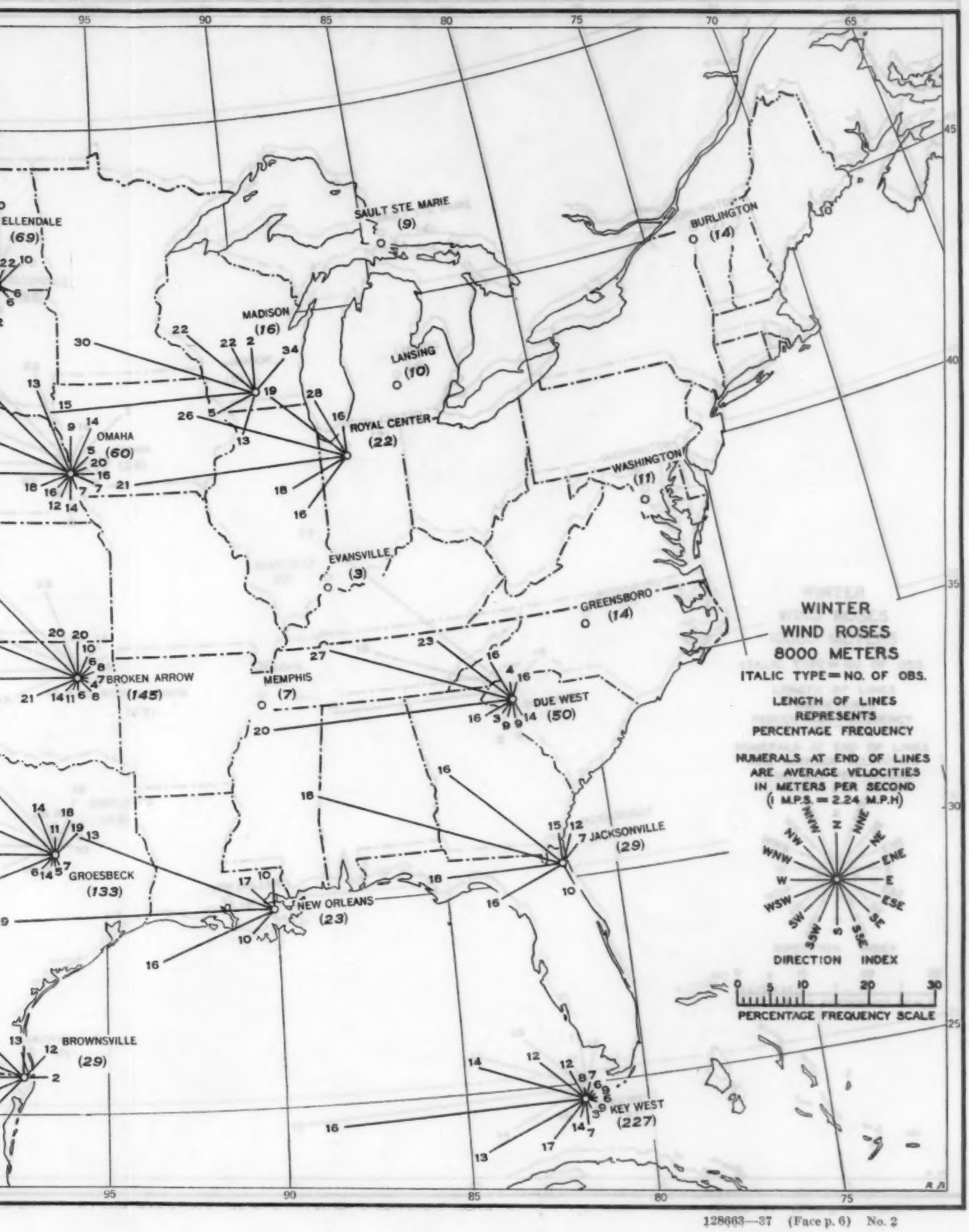
FIGURE 1.



128663—37 (Face p. 6) No. 1


PORTLAND (39)
HAVRE (41)
ELLENDALE (69)
BOISE (55)
SHERIDAN (38)
REDDING (99)
CHEYENNE (60)
SAN FRANCISCO (63)
MODENA (124)
LOS ANGELES (51)
WINSLOW (91)
AMARILLO (78)
EL PASO (86)

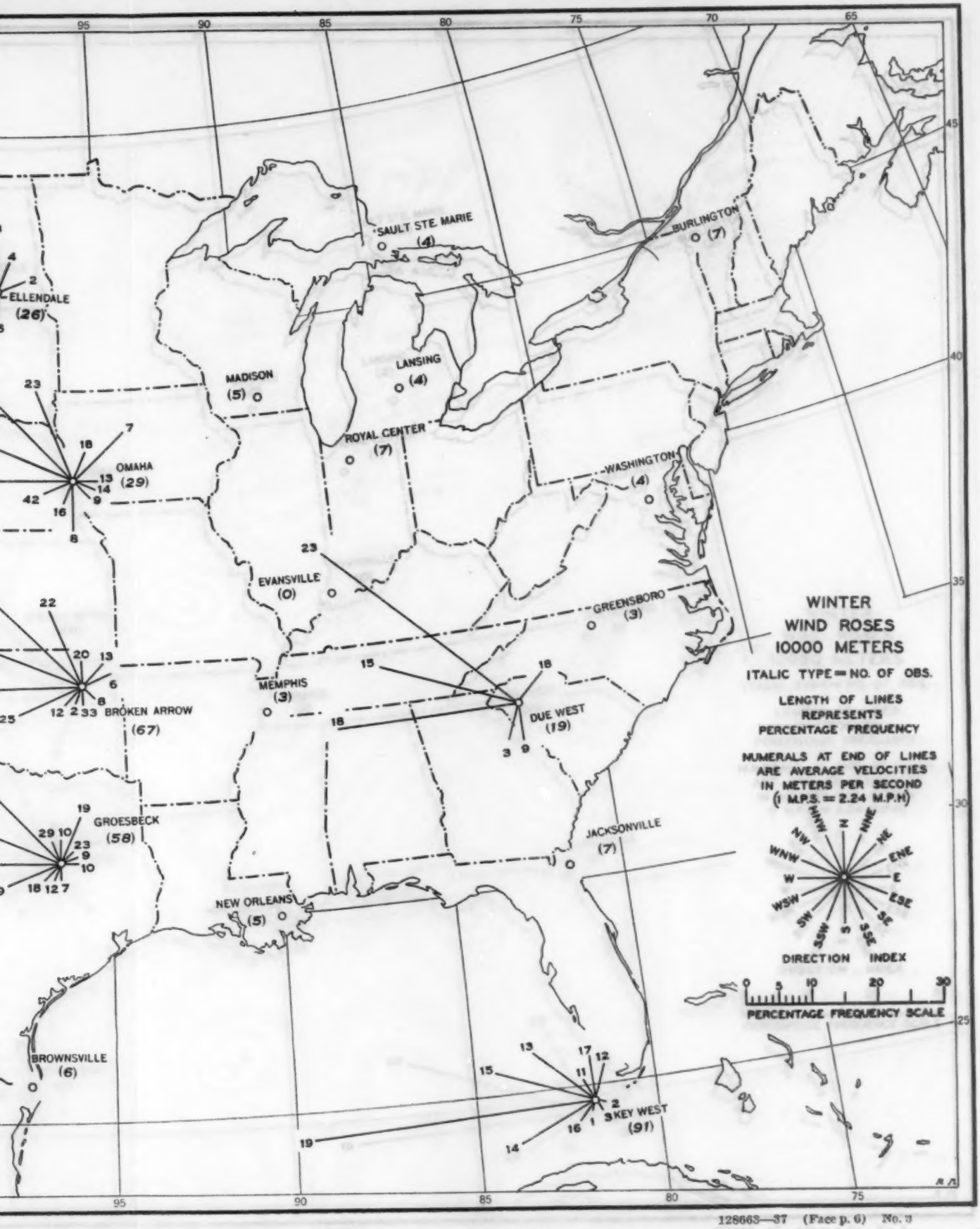
FIGURE 2.



128663—37 (Face p. 6) No. 2


HAVRE
(16)
PORTLAND
(24)
BOISE
(22)
SHERIDAN
(16)
ELLENDALE
(26)
REDDING
(50)
CHEYENNE
(15)
SAN FRANCISCO
(29)
MODENA
(46)
AMARILLO
(23)
WINSLOW
(51)
LOS ANGELES
(25)
EL PASO
(31)

FIGURE 3.



128663—37 (Face p. 6) No. 3


130
125
120
115
110
105
100
45
40
35
30
25
PORTLAND
(7)
HAVRE
(3)
ELLENDALE
(6)
BOISE
(7)
SHERIDAN
(7)
REDDING
(22)
CHEYENNE
(3)
SAN FRANCISCO
(12)
MODENA
(8)
LOS ANGELES
(7)
WINSLOW
(26)
AMARILLO
(1)
EL PASO
(14)
19
17
14
7
11
21
10
14
8
15
9
10
9
21
18
18
22
21
21
18
14
22
24
26
29
30
23
29
23
39
8

FIGURE 4.

128663—37 (Face p. 6) No. 4

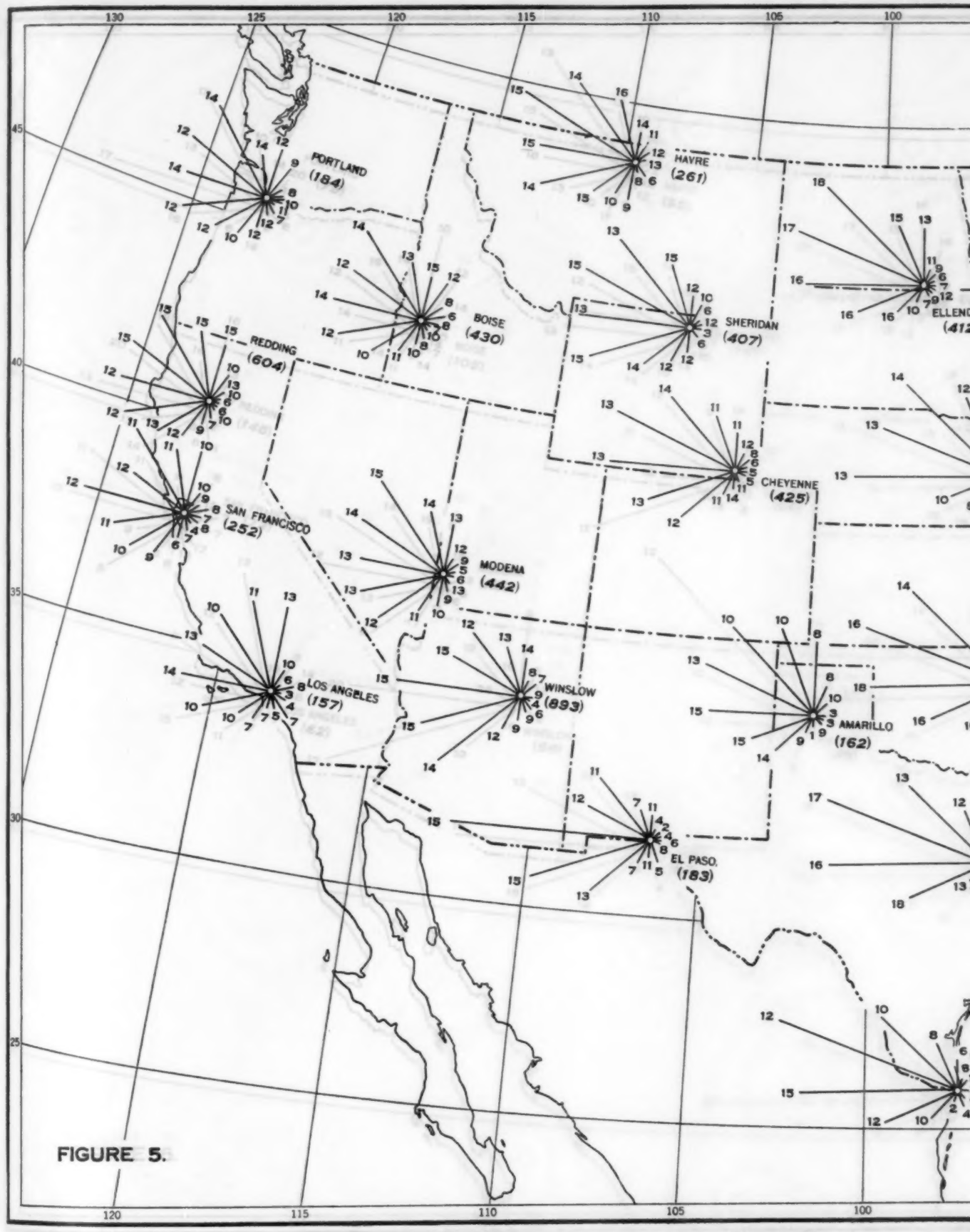
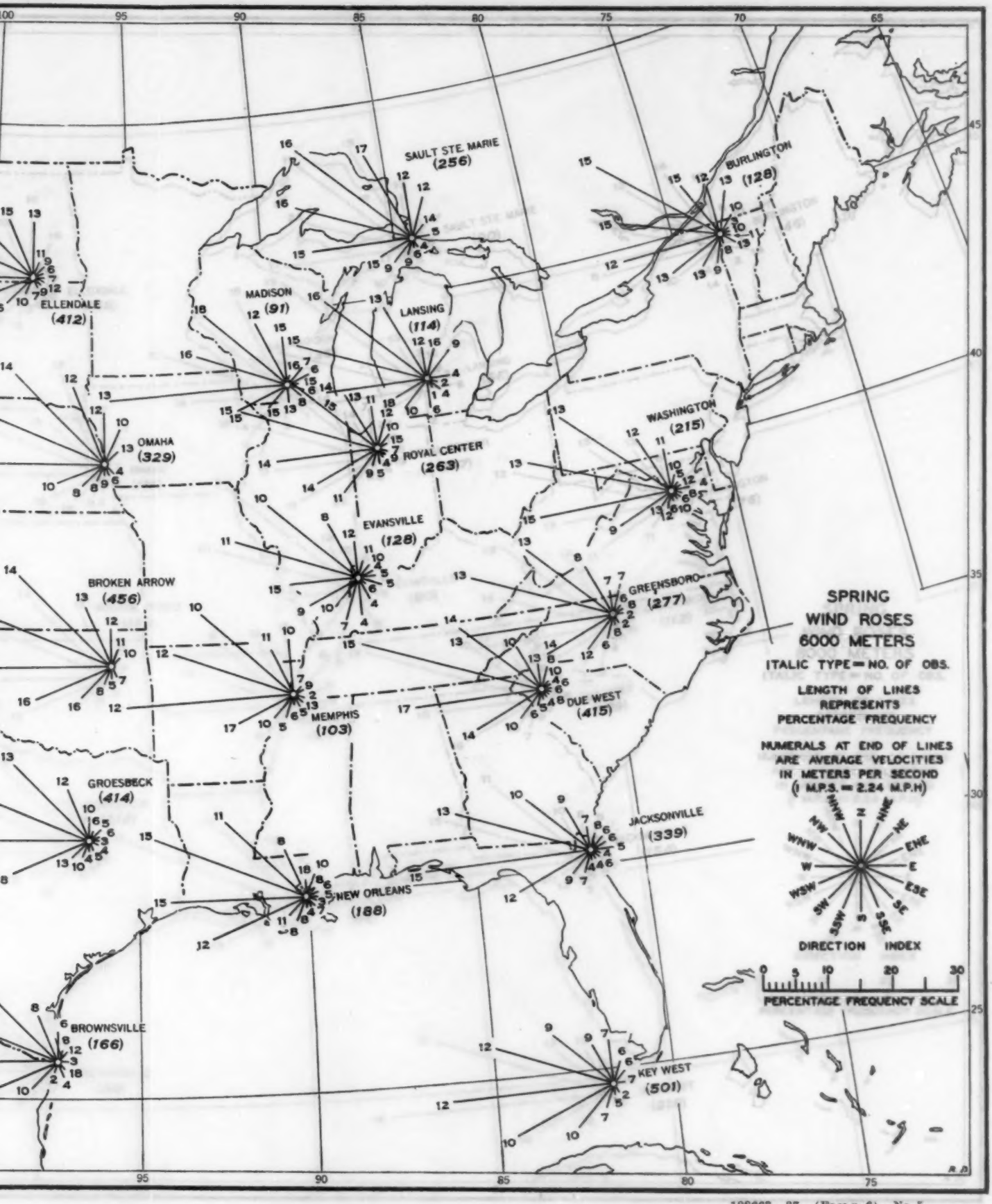

130
125
120
115
110
105
100
45
40
35
30
25
PORTLAND
(184)
HAVRE
(261)
BOISE
(430)
SHERIDAN
(407)
REDDING
(604)
CHEYENNE
(425)
SAN FRANCISCO
(252)
MODENA
(442)
LOS ANGELES
(157)
WINSLOW
(893)
AMARILLO
(162)
EL PASO
(183)

FIGURE 5.


SAULT STE. MARIE
(256)
BURLINGTON
(128)
ELLENDALE
(412)
MADISON
(91)
LANSING
(114)
OMAHA
(329)
ROYAL CENTER
(263)
WASHINGTON
(215)
EVANSVILLE
(128)
BROKEN ARROW
(456)
GREENSBORO
(277)
MEMPHIS
(103)
DUE WEST
(415)
GROESBECK
(414)
JACKSONVILLE
(339)
NEW ORLEANS
(188)
BROWNSVILLE
(166)
KEY WEST
(501)
SPRING
WIND ROSES
6000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H)
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DIRECTION INDEX
0 5 10 20 30
PERCENTAGE FREQUENCY SCALE
100
95
90
85
80
75
70
65
45
40
35
30
25

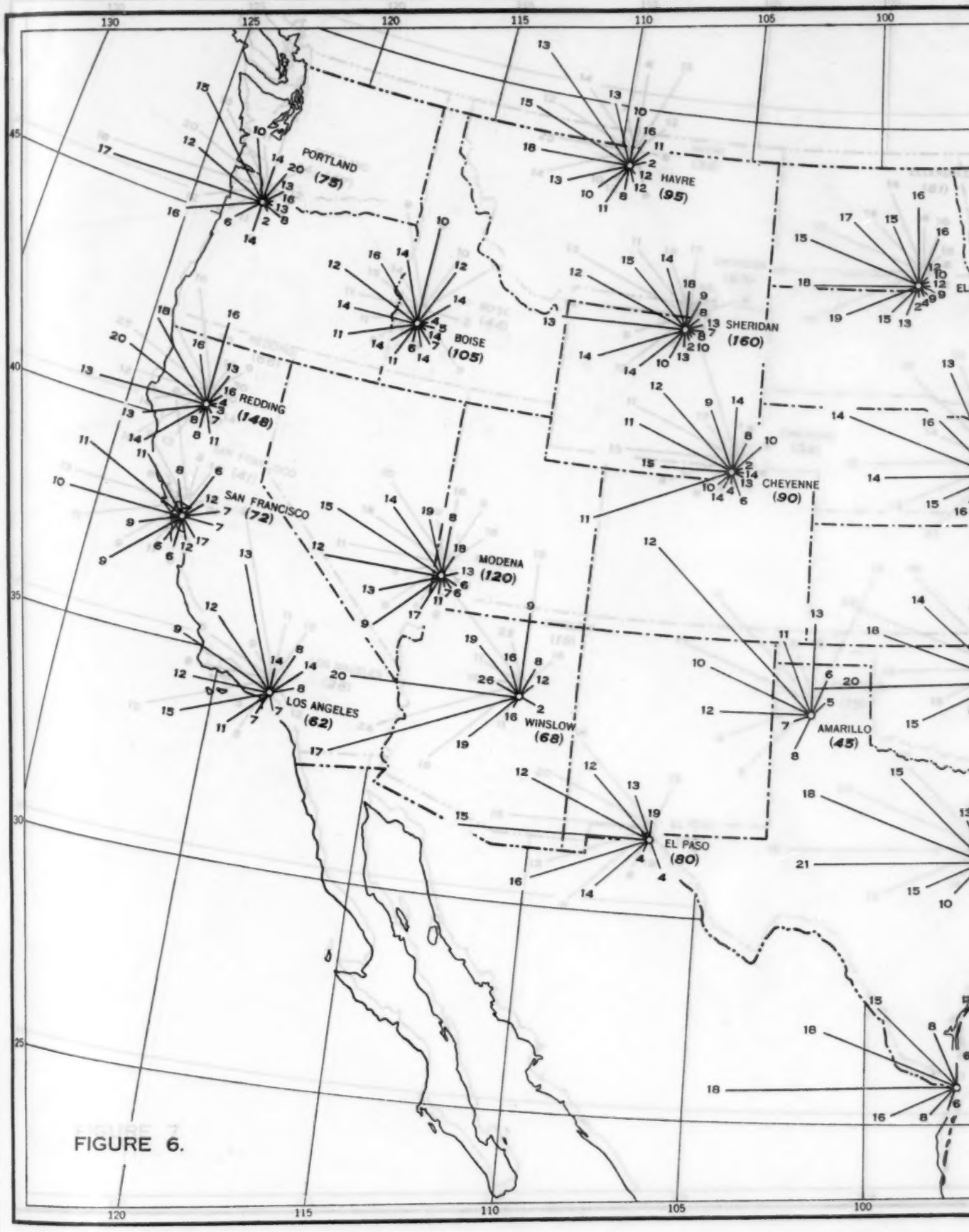
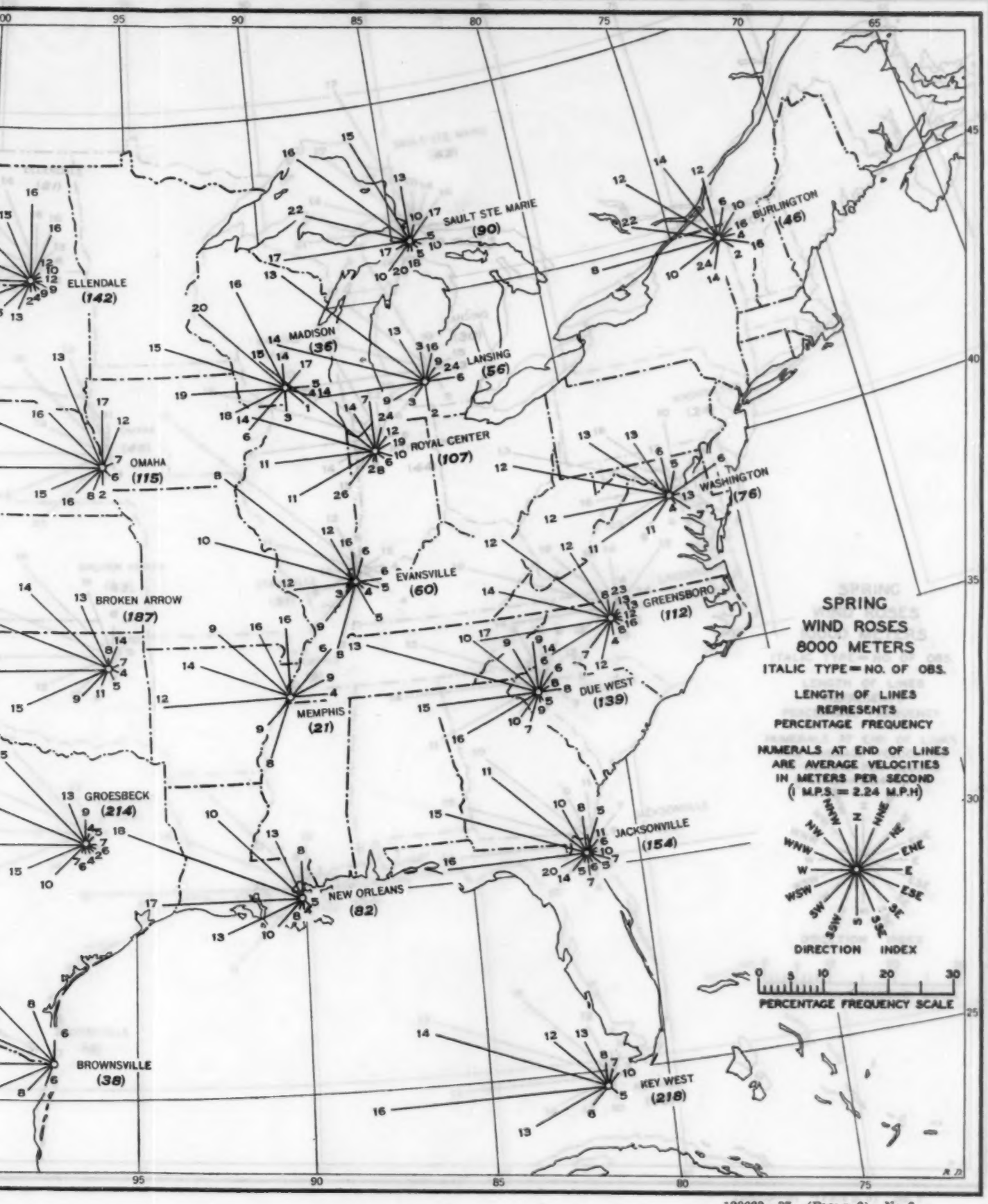

PORTLAND (75)
HAVRE (95)
BOISE (105)
SHERIDAN (160)
REDDING (148)
CHEYENNE (90)
SAN FRANCISCO (72)
MODENA (120)
LOS ANGELES (62)
WINSLOW (68)
AMARILLO (45)
EL PASO (80)

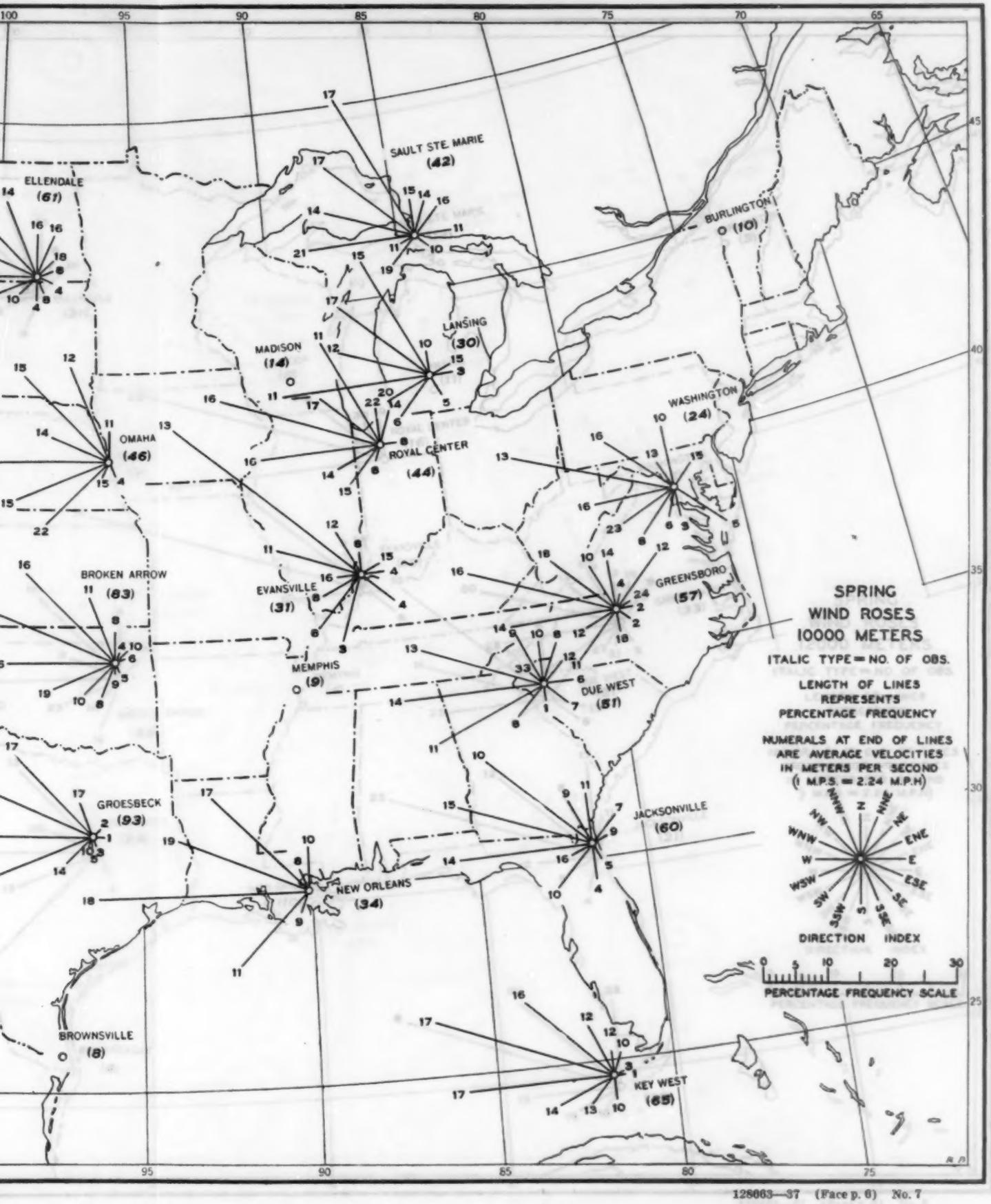
FIGURE 6.



128663—37 (Face p. 6) No. 6

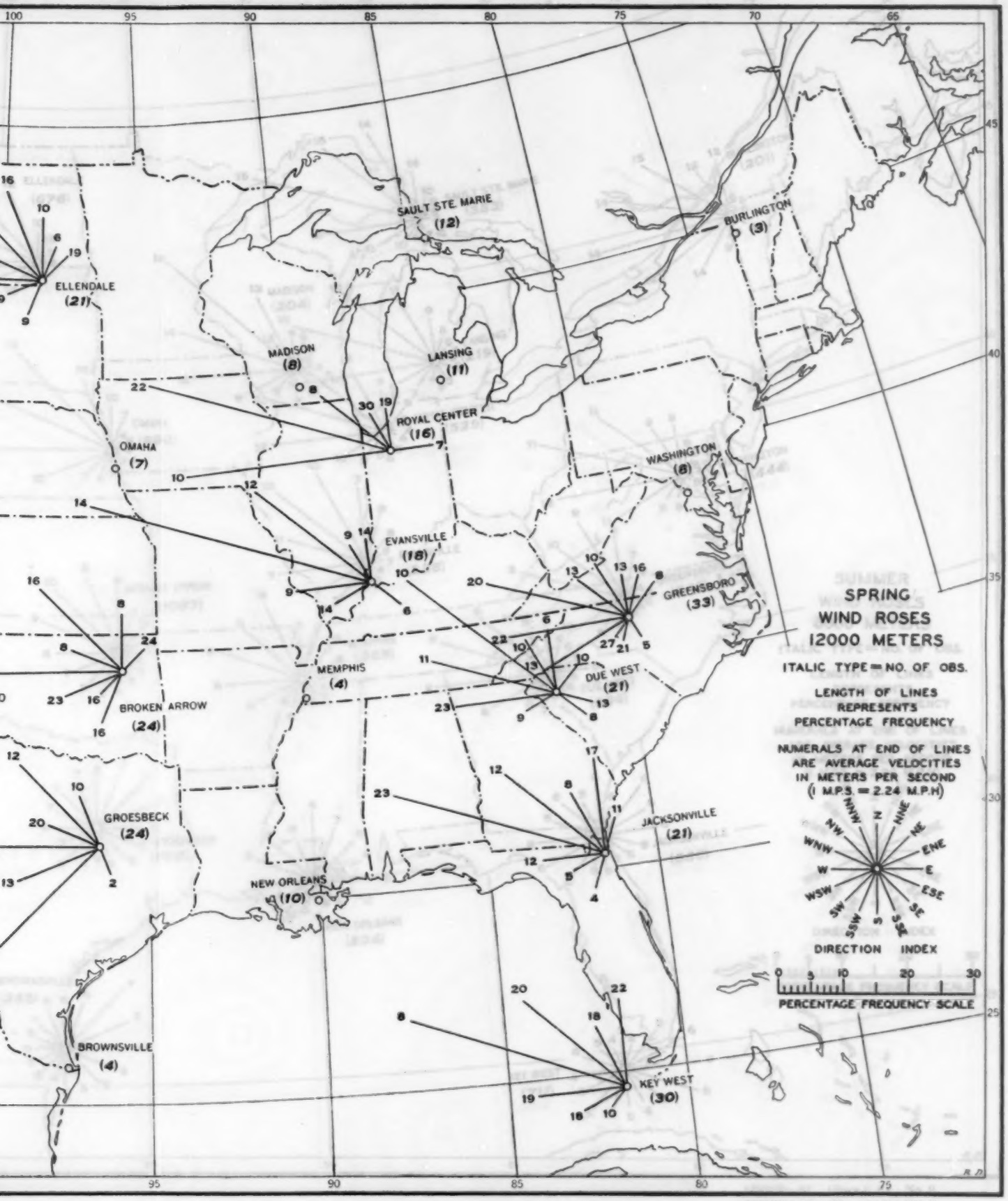

PORTLAND (47)
HAVRE (38)
ELLENDALE (61)
SHERIDAN (63)
BOISE (44)
REDDING (66)
CHEYENNE (32)
SAN FRANCISCO (41)
MODENA (34)
WINSLOW (18)
LOS ANGELES (26)
AMARILLO (15)
EL PASO (32)
130
125
120
115
110
105
100
45
40
35
30
25

FIGURE 7.


SAULT STE MARIE
(42)
ELLENDALE
(61)
BURLINGTON
(10)
LANSING
(30)
MADISON
(14)
WASHINGTON
(24)
OMAHA
(46)
ROYAL CENTER
(44)
GREENSBORO
(57)
BROKEN ARROW
(83)
EVANSVILLE
(31)
MEMPHIS
(9)
DUE WEST
(51)
GROESBECK
(93)
JACKSONVILLE
(60)
NEW ORLEANS
(34)
BROWNSVILLE
(8)
KEY WEST
(65)
SPRING
WIND ROSES
10000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H)
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DIRECTION INDEX
0 5 10 20 30
PERCENTAGE FREQUENCY SCALE
100
95
90
85
80
75
70
65
45
40
35
30
25


HAVRE
(8)
PORTLAND
(15)
BOISE
(19)
SHERIDAN
(19)
REDDING
(27)
CHEYENNE
(11)
SAN FRANCISCO
(5)
MODENA
(12)
WINSLOW
(9)
LOS ANGELES
(10)
AMARILLO
(1)
EL PASO
(10)

FIGURE 8.



128063—37 (Face p. 6) No. 8

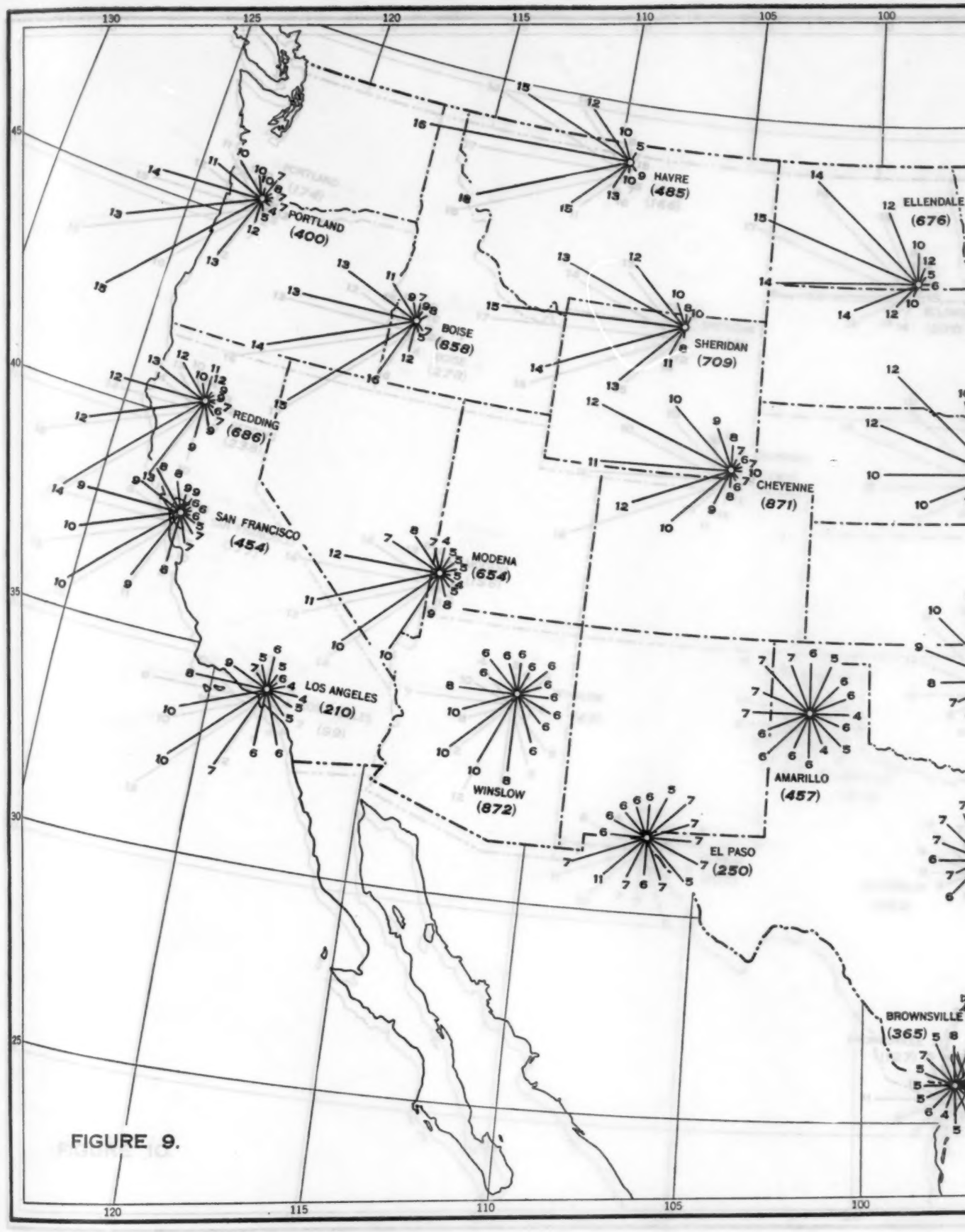
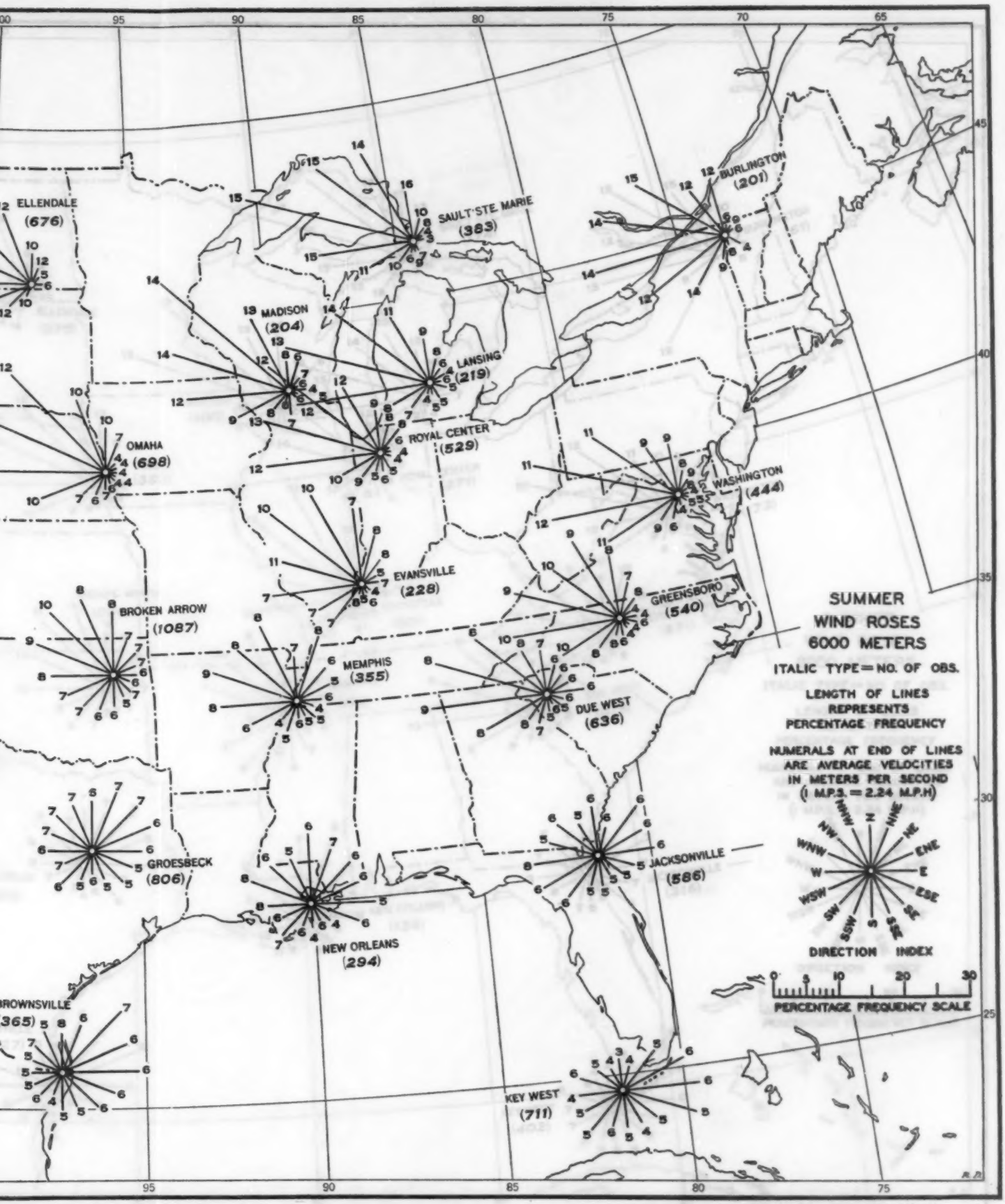

130
125
120
115
110
105
100
45
40
35
30
25
HAVRE
(485)
PORTLAND
(400)
ELLENDALE
(676)
BOISE
(858)
SHERIDAN
(709)
REDDING
(686)
CHEYENNE
(871)
SAN FRANCISCO
(454)
MODENA
(654)
LOS ANGELES
(210)
WINSLOW
(872)
AMARILLO
(457)
EL PASO
(250)
BROWNSVILLE
(365)

FIGURE 9.


ELLENDALE
(676)
SAULT STE MARIE
(383)
BURLINGTON
(201)
MADISON
(204)
LANSING
(219)
ROYAL CENTER
(529)
OMAHA
(698)
WASHINGTON
(444)
EVANSVILLE
(228)
GREENSBORO
(540)
BROKEN ARROW
(1087)
MEMPHIS
(355)
DUE WEST
(636)
GROESBECK
(806)
JACKSONVILLE
(586)
NEW ORLEANS
(294)
BROWNSVILLE
(365)
KEY WEST
(711)
SUMMER
WIND ROSES
6000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H)
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DIRECTION INDEX
0 5 10 20 30
PERCENTAGE FREQUENCY SCALE
95
90
85
80
75
70
65
45
40
35
30
25

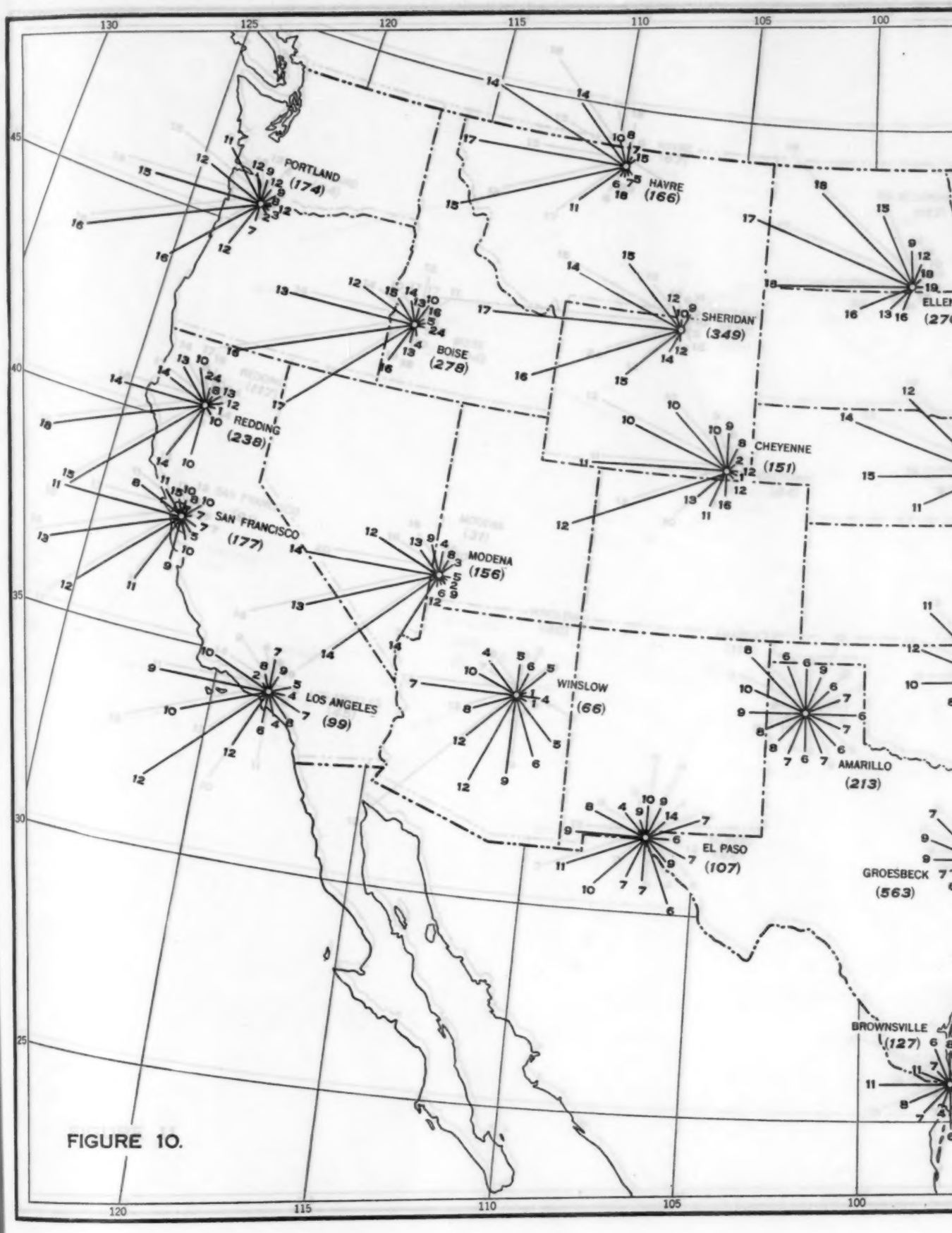
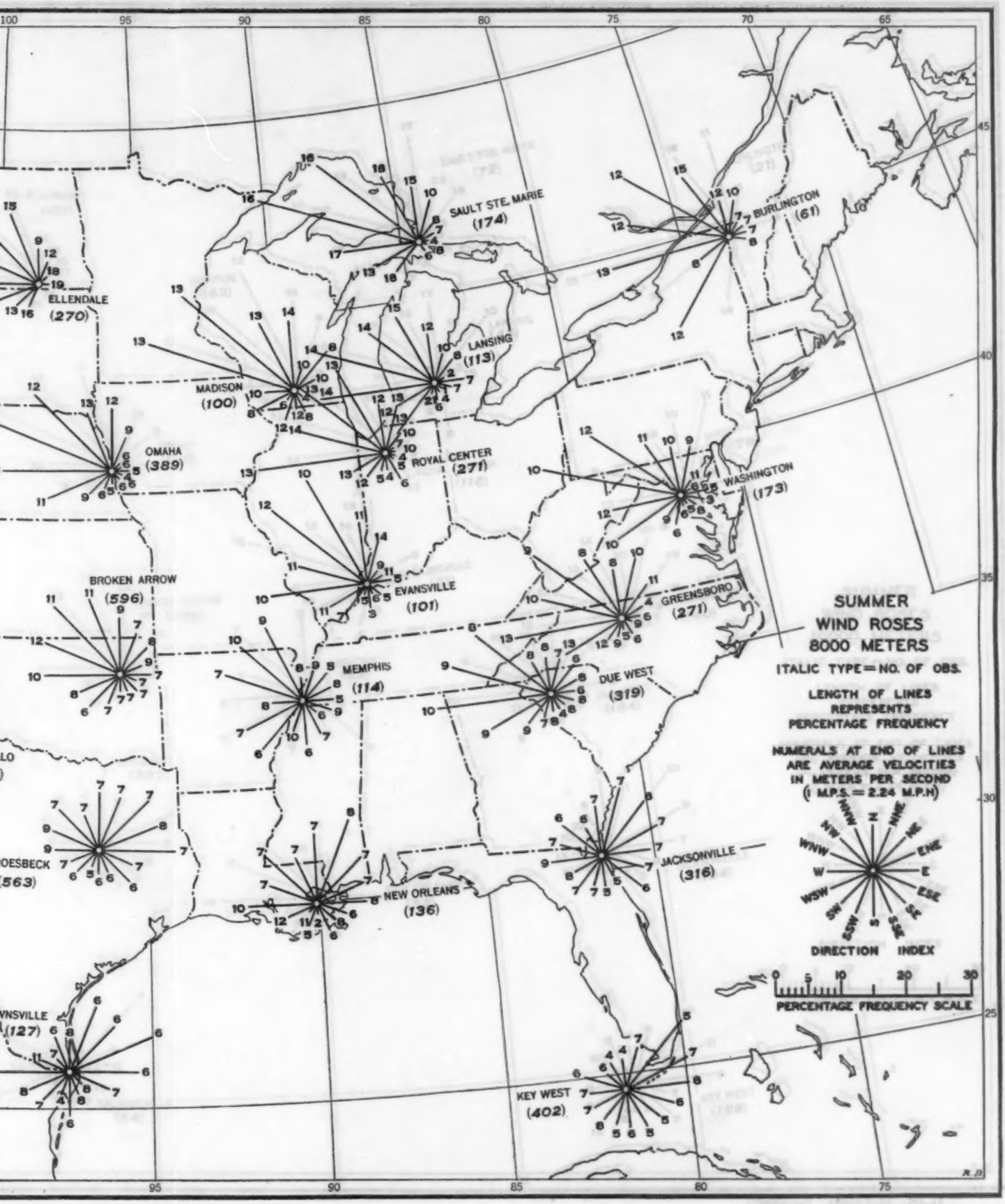

130
125
120
115
110
105
100
45
40
35
30
25
120
115
110
105
100
PORTLAND
(174)
HAVRE
(166)
BOISE
(278)
SHERIDAN
(349)
REDDING
(238)
CHEYENNE
(151)
SAN FRANCISCO
(177)
MODENA
(156)
LOS ANGELES
(99)
WINSLOW
(66)
AMARILLO
(213)
EL PASO
(107)
GROESBECK
(563)
BROWNSVILLE
(127)

FIGURE 10.


SAULT STE. MARIE
(174)
BURLINGTON
(61)
ELLENDALE
(270)
LANSING
(113)
MADISON
(100)
OMAHA
(389)
ROYAL CENTER
(271)
WASHINGTON
(173)
BROKEN ARROW
(596)
EVANSVILLE
(101)
GREENSBORO
(271)
MEMPHIS
(114)
DUE WEST
(319)
JACKSONVILLE
(316)
NEW ORLEANS
(136)
KEY WEST
(402)
SUMMER
WIND ROSES
8000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H)
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DIRECTION INDEX
0 5 10 20 30
PERCENTAGE FREQUENCY SCALE
100
95
90
85
80
75
70
65
45
40
35
30
25

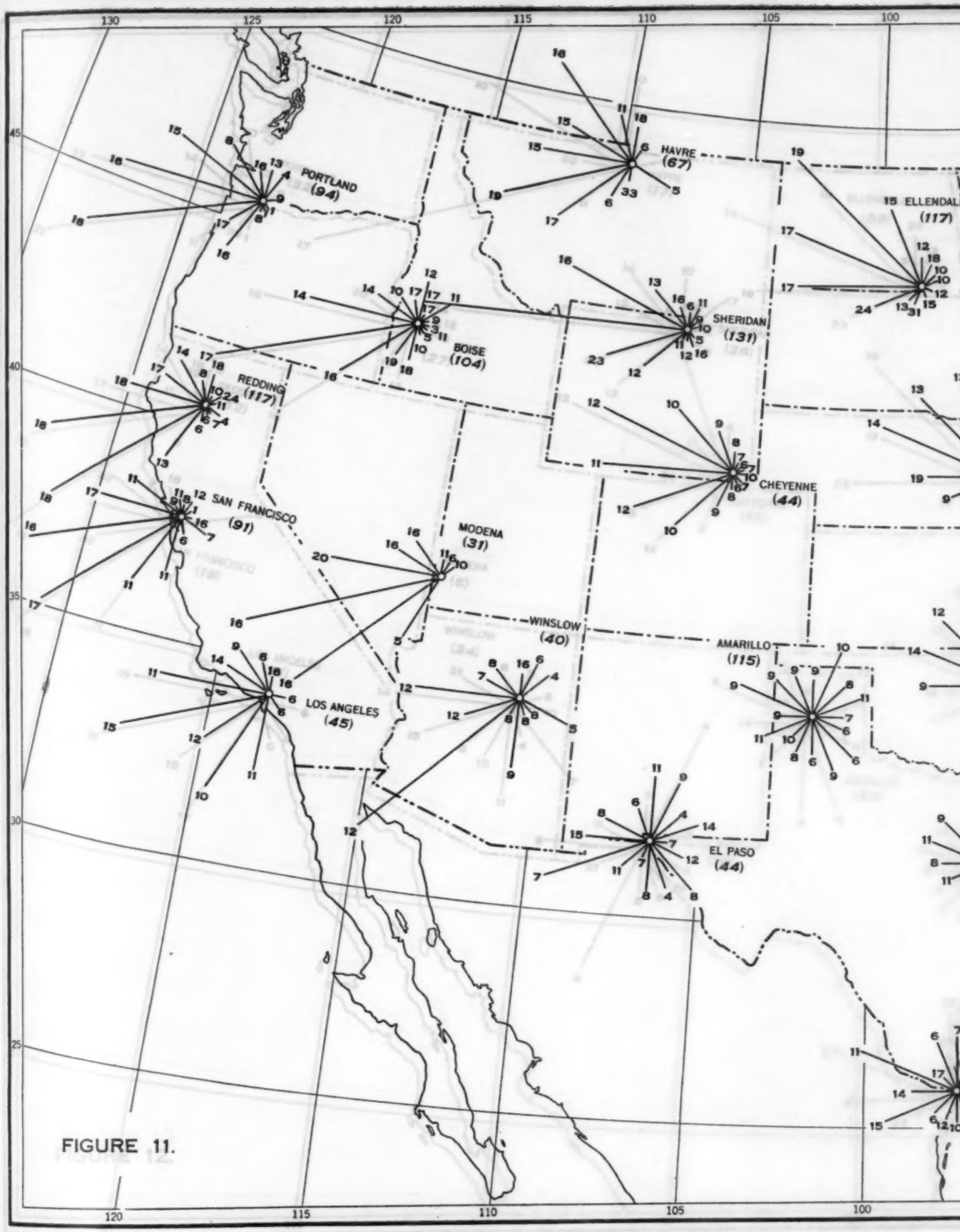
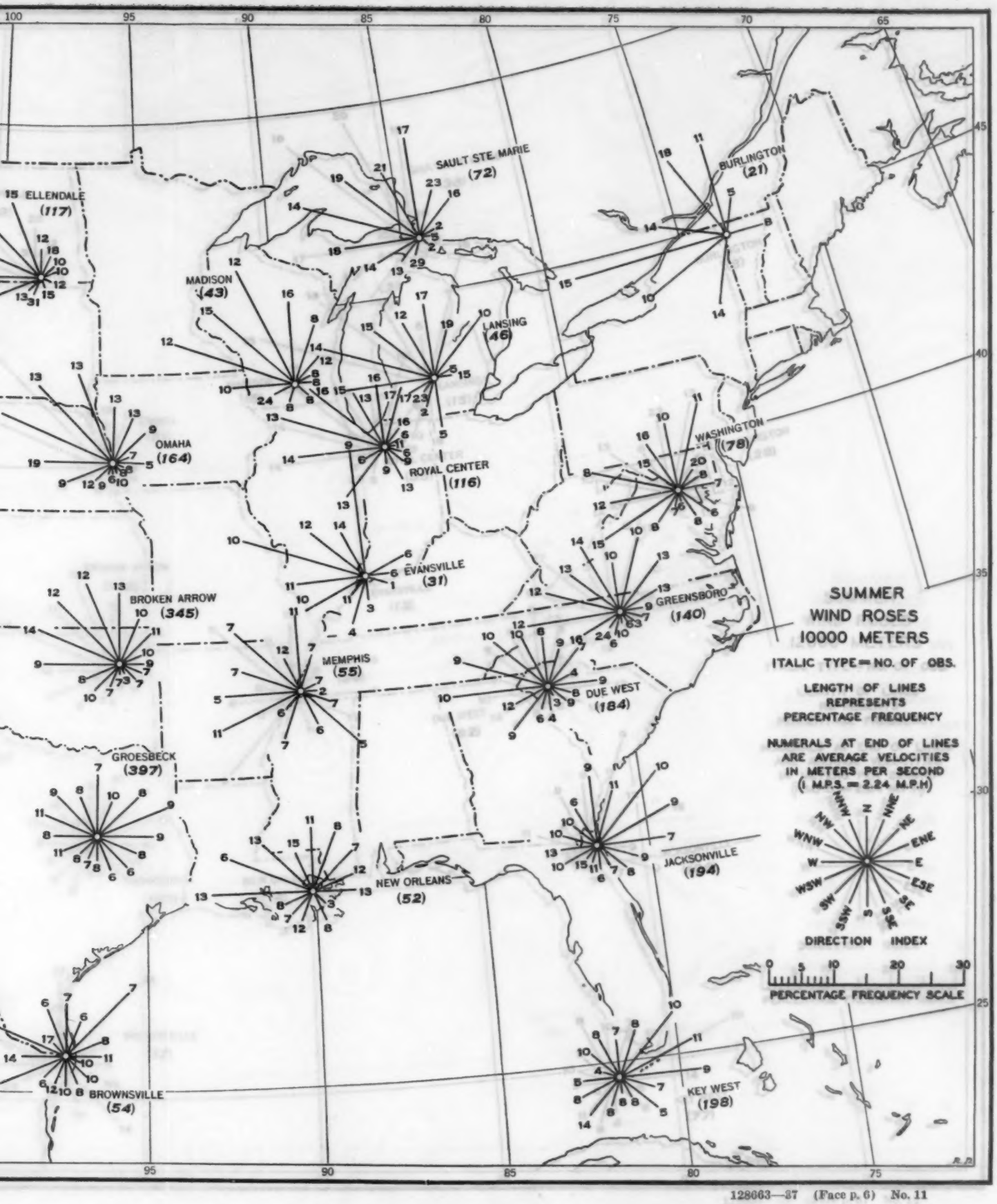

130
125
120
115
110
105
100
45
40
35
30
25
120
115
110
105
100
PORTLAND
(94)
HAVRE
(67)
ELLENDAL
(117)
SHERIDAN
(131)
BOISE
(104)
REDDING
(117)
CHEYENNE
(44)
SAN FRANCISCO
(91)
MODENA
(31)
WINSLOW
(40)
AMARILLO
(115)
LOS ANGELES
(45)
EL PASO
(44)

FIGURE 11.



128663—37 (Face p. 6) No. 11

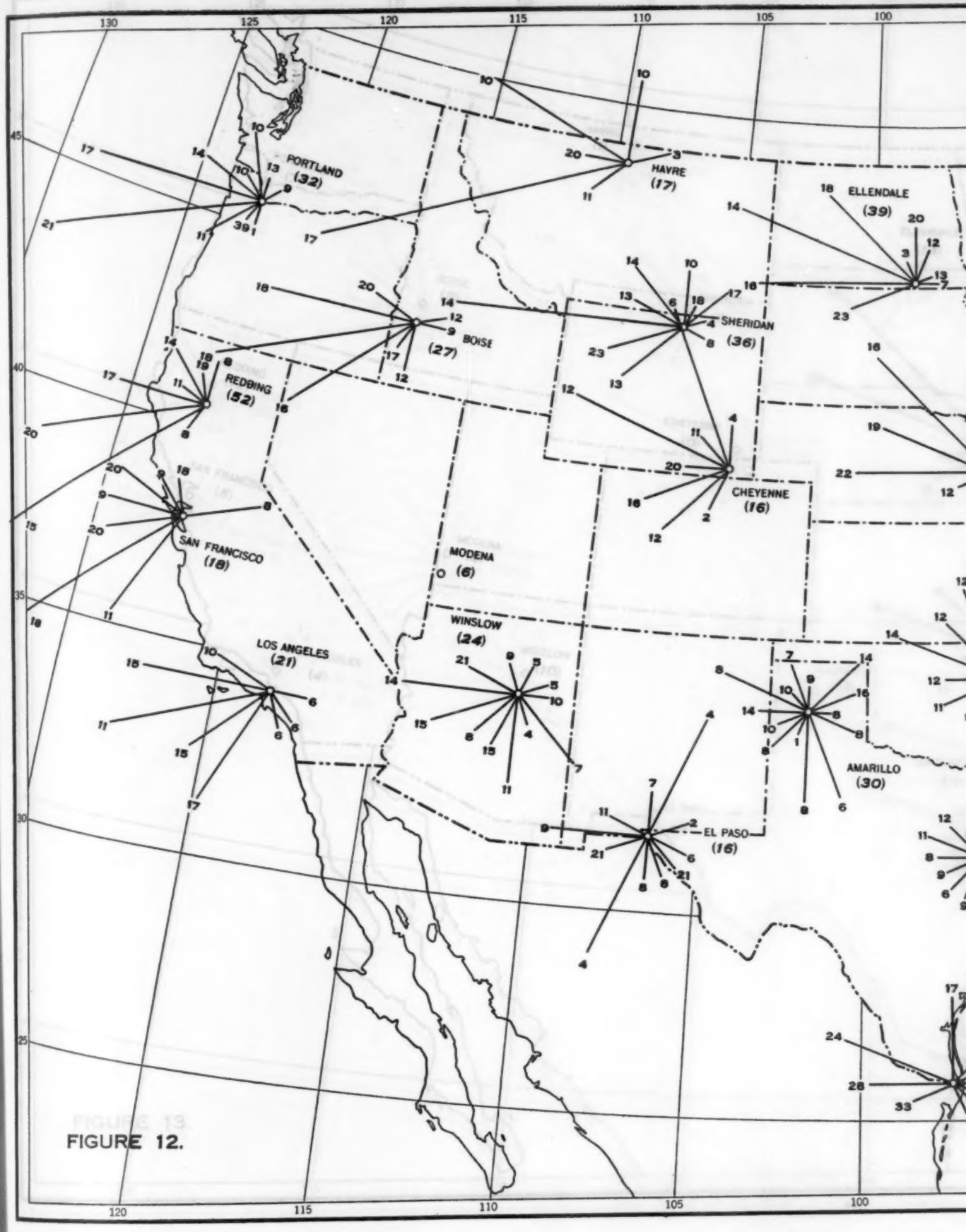
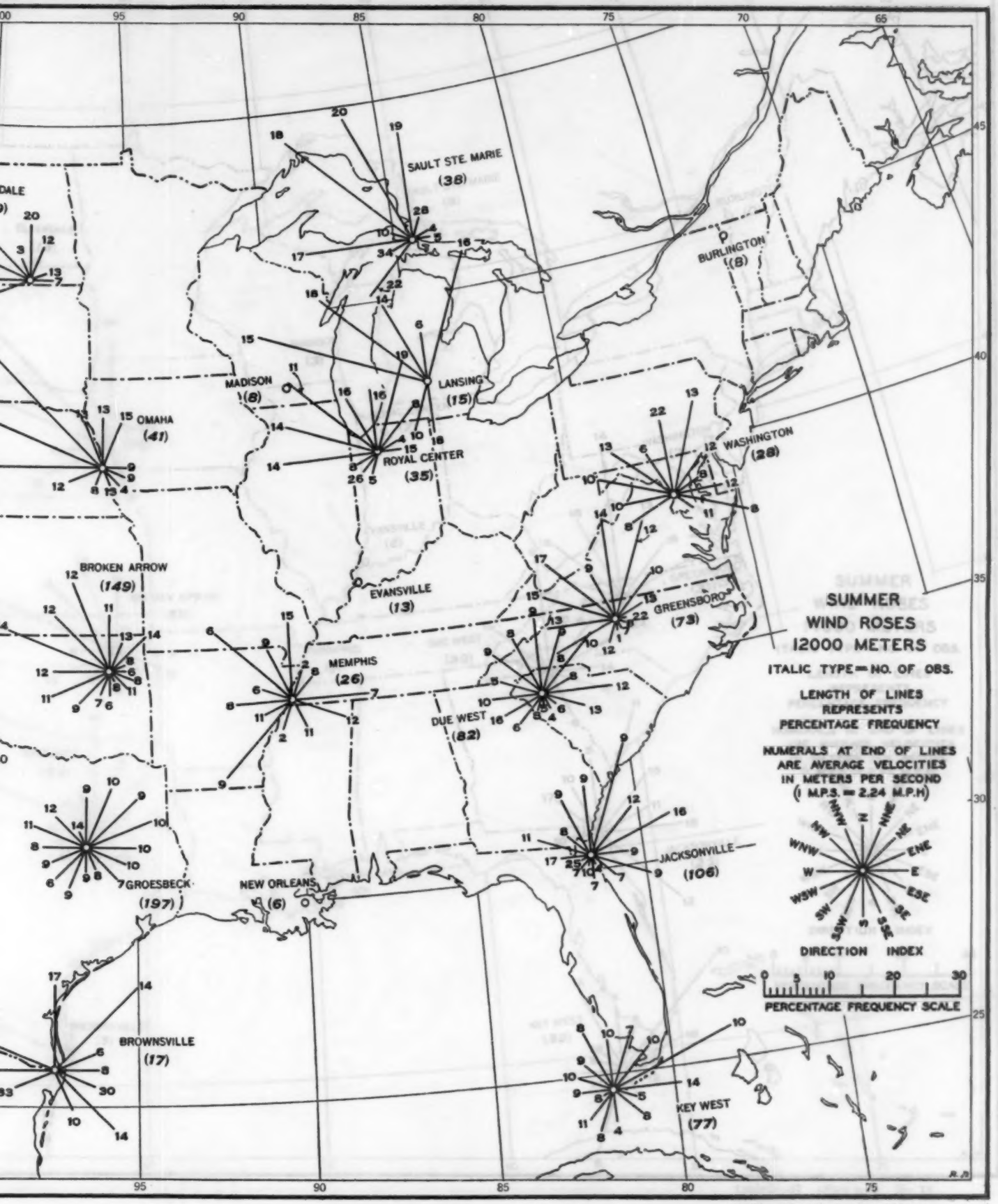
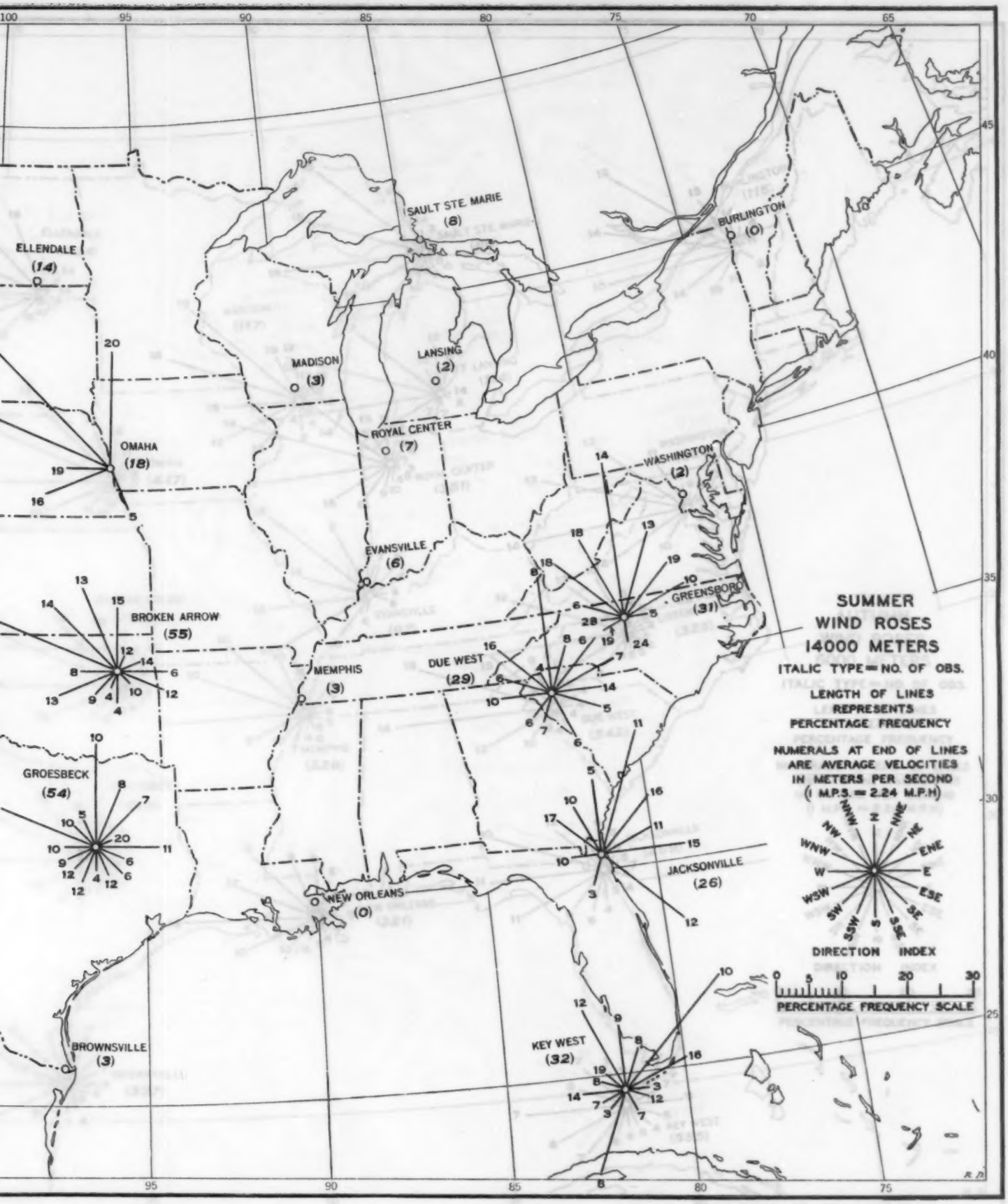

PORTLAND (32)
HAVRE (17)
ELLENDALE (39)
BOISE (27)
SHERIDAN (36)
REDBING (52)
CHEYENNE (16)
SAN FRANCISCO (18)
MODENA (6)
WINSLOW (24)
LOS ANGELES (21)
AMARILLO (30)
EL PASO (16)

FIGURE 12.


SAULT STE. MARIE
(38)
BURLINGTON
(8)
MADISON
(8)
LANSING
(15)
OMAHA
(41)
ROYAL CENTER
(35)
WASHINGTON
(28)
BROKEN ARROW
(149)
EVANSVILLE
(13)
GREENSBORO
(73)
MEMPHIS
(26)
DUE WEST
(82)
JACKSONVILLE
(106)
GROESBECK
(197)
NEW ORLEANS
(6)
BROWNSVILLE
(17)
KEY WEST
(77)
SUMMER
WIND ROSES
12000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H)
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DIRECTION INDEX
0 5 10 20 30
PERCENTAGE FREQUENCY SCALE
100
95
90
85
80
75
70
65
45
40
35
30
25


130
125
120
115
110
105
100
45
40
35
30
25
HAVRE
(1)
PORTLAND
(7)
ELLENDALE
(14)
BOISE
(3)
SHERIDAN
(3)
REDDING
(12)
CHEYENNE
(0)
SAN FRANCISCO
(5)
MODENA
(2)
LOS ANGELES
(4)
WINSLOW
(10)
AMARILLO
(12)
EL PASO
(0)
12
25
19
16
14
9
13
11
10
120
115
110
105
100

FIGURE 13.



128663—37 (Face p. 6) No. 13

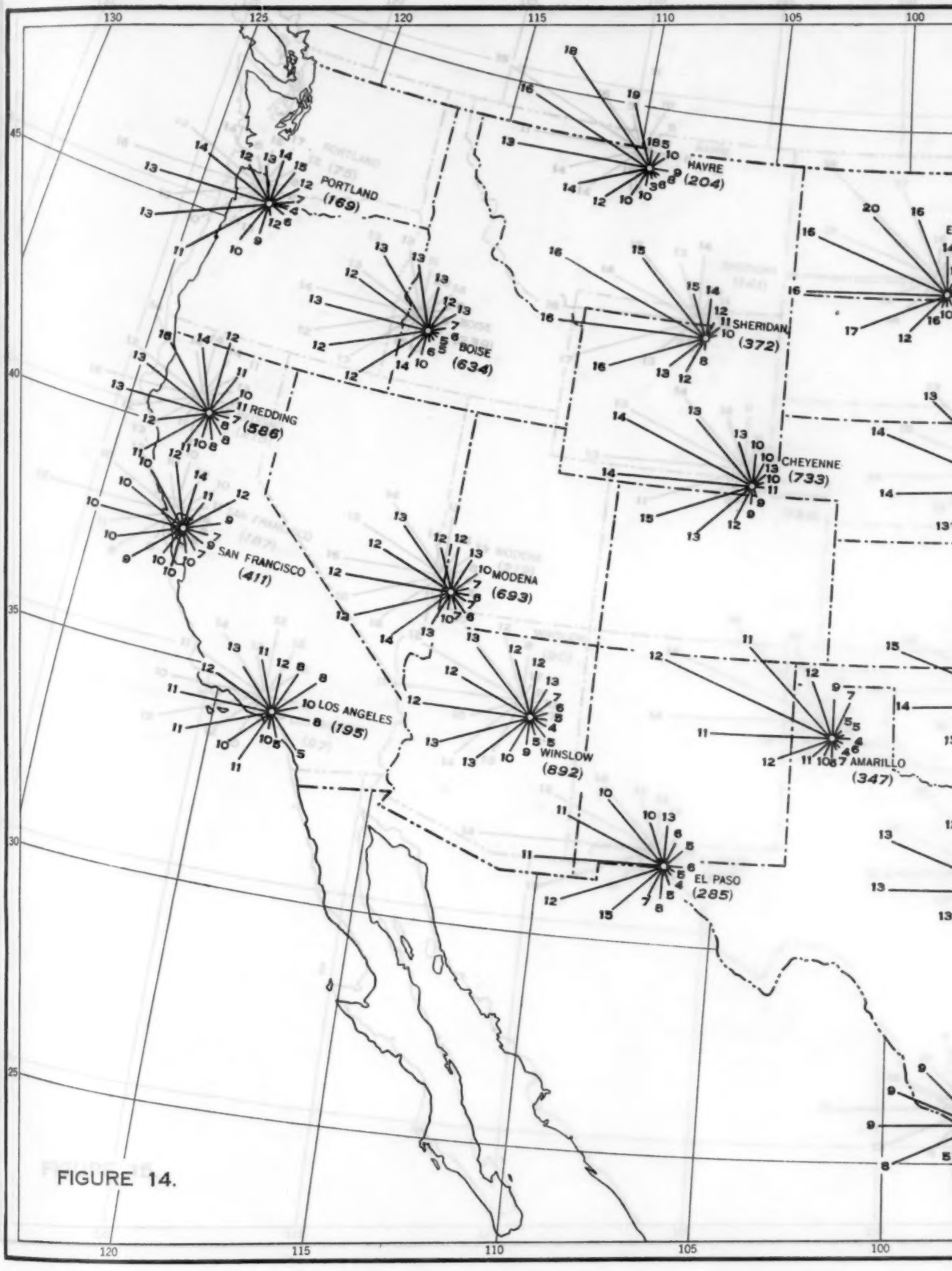
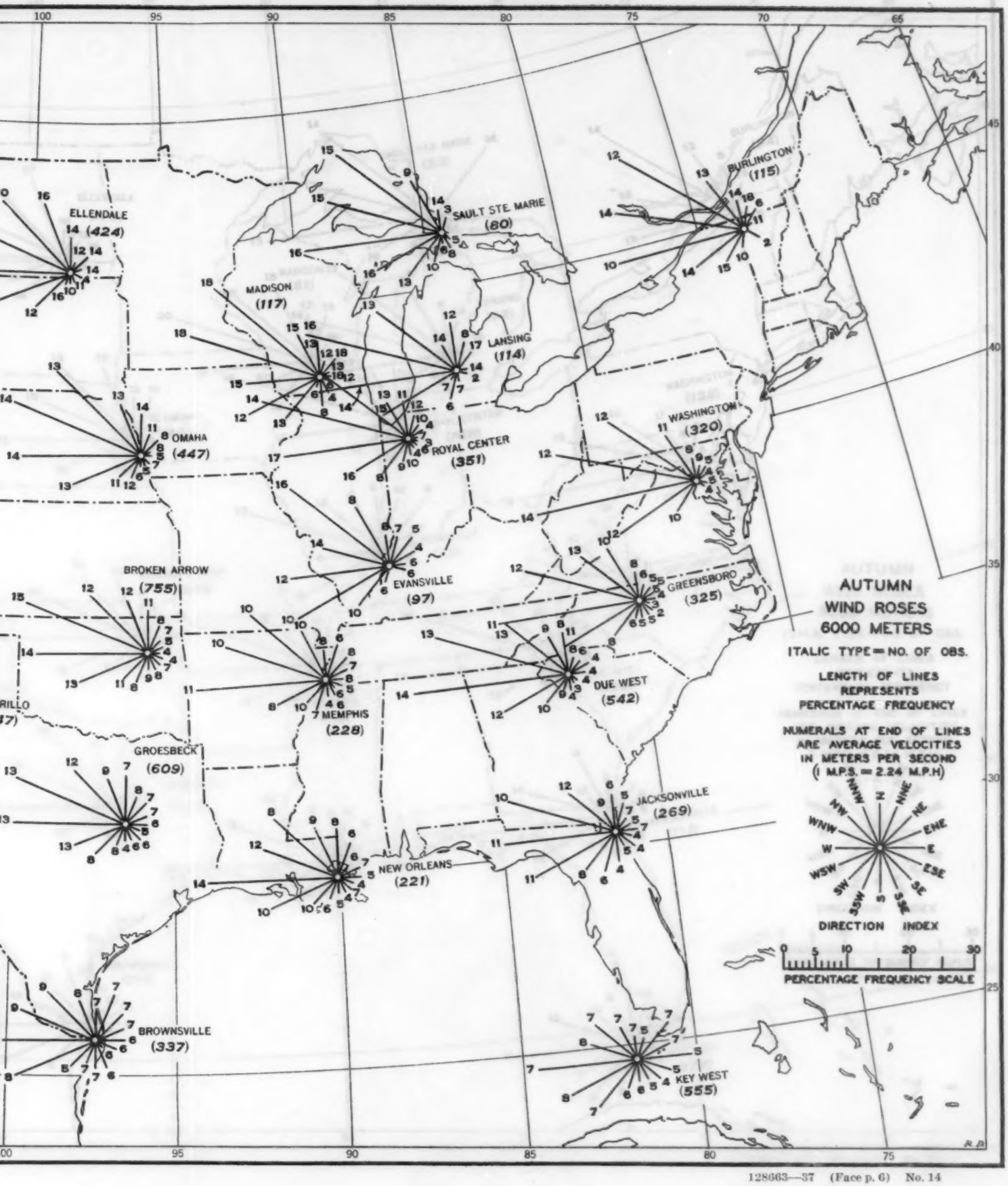

PORTLAND
(169)
HAVRE
(204)
BOISE
(634)
SHERIDAN
(372)
REDDING
(586)
CHEYENNE
(733)
SAN FRANCISCO
(411)
MODENA
(693)
LOS ANGELES
(195)
WINSLOW
(892)
AMARILLO
(347)
EL PASO
(285)

FIGURE 14.


AUTUMN
WIND ROSES
6000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES REPRESENTS PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES ARE AVERAGE VELOCITIES IN METERS PER SECOND (1 M.P.S. = 2.24 M.P.H)
DIRECTION INDEX
PERCENTAGE FREQUENCY SCALE
ELLENDALE (424)
SAULT STE MARIE (80)
BURLINGTON (115)
MADISON (117)
LANSING (114)
OMAHA (447)
ROYAL CENTER (351)
WASHINGTON (320)
BROKEN ARROW (755)
EVANSVILLE (97)
GREENSBORO (325)
DUE WEST (542)
MEMPHIS (228)
GROESBECK (609)
JACKSONVILLE (269)
NEW ORLEANS (221)
BROWNSVILLE (337)
KEY WEST (555)

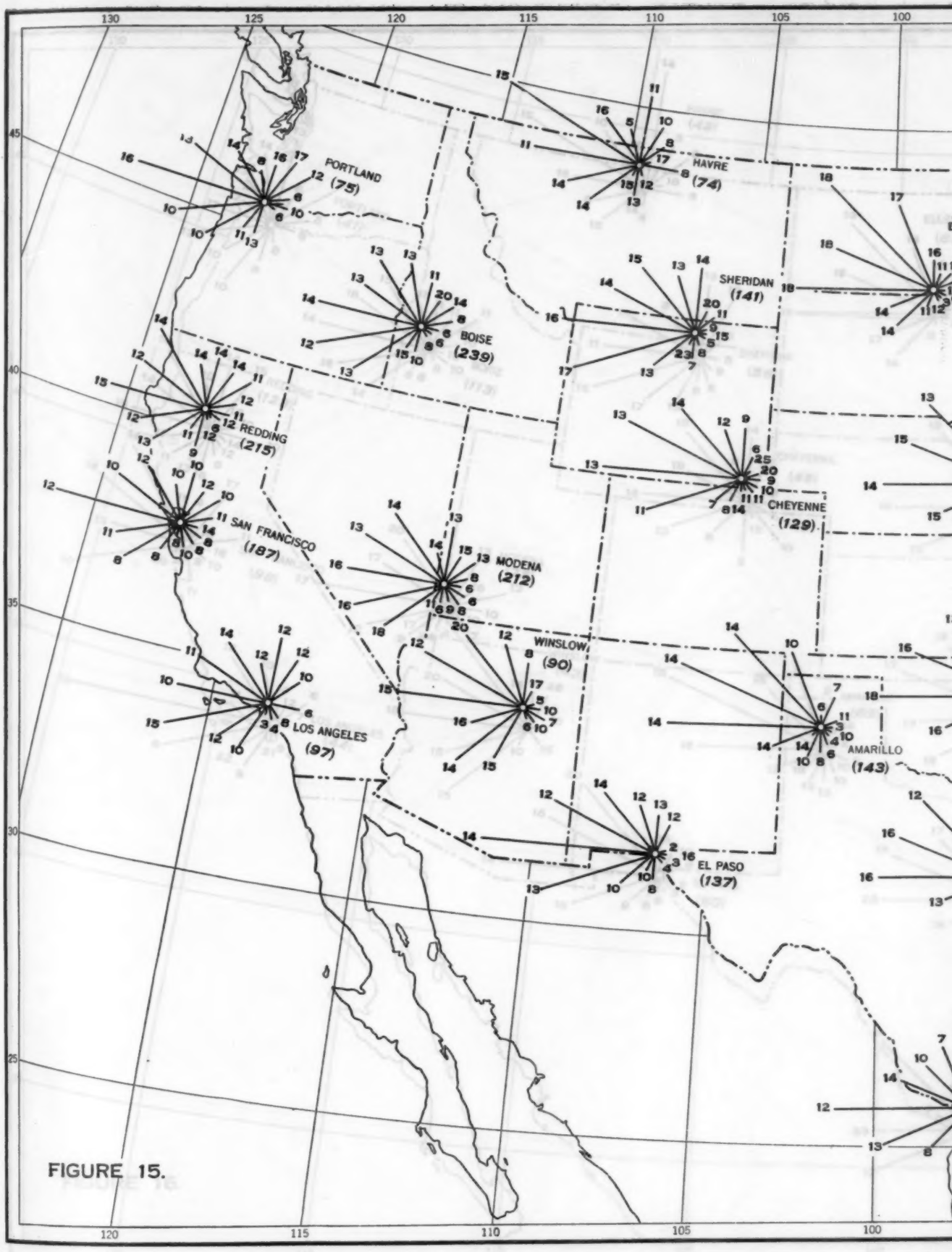
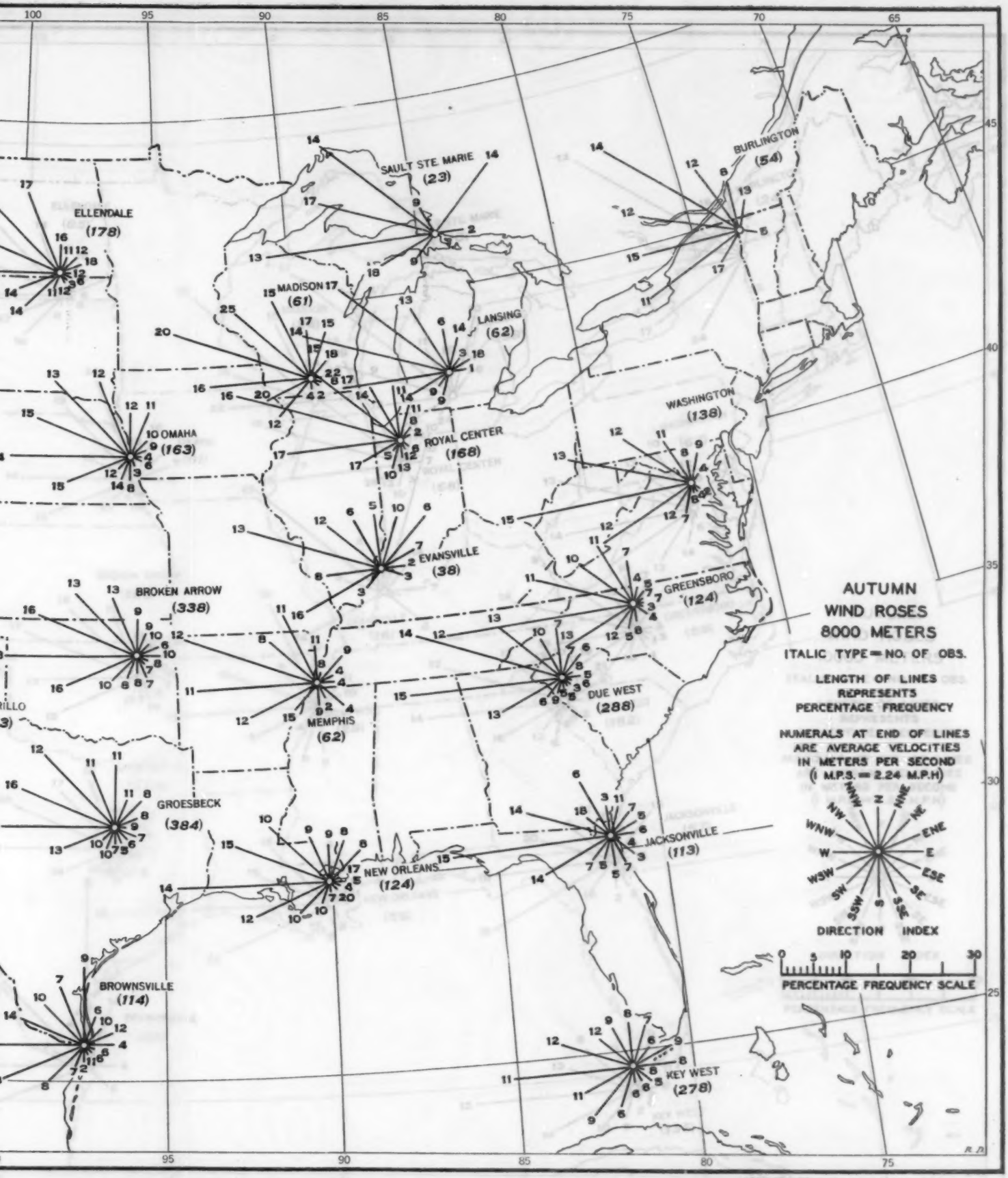

PORTLAND (75)
HAVRE (74)
BOISE (239)
SHERIDAN (141)
REDDING (215)
CHEYENNE (129)
SAN FRANCISCO (187)
MODENA (212)
WINSLOW (90)
LOS ANGELES (97)
AMARILLO (143)
EL PASO (137)

FIGURE 15.


AUTUMN
WIND ROSES
8000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES REPRESENTS PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES ARE AVERAGE VELOCITIES IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H)
DIRECTION INDEX
PERCENTAGE FREQUENCY SCALE
ELLENDALE (178)
SAULT STE MARIE (23)
BURLINGTON (54)
MADISON (61)
LANSING (62)
OMAHA (163)
ROYAL CENTER (168)
WASHINGTON (138)
EVANSVILLE (38)
BROKEN ARROW (338)
GREENSBORO (124)
DUE WEST (288)
MEMPHIS (62)
GROESBECK (384)
JACKSONVILLE (113)
NEW ORLEANS (124)
BROWNSVILLE (114)
KEY WEST (278)

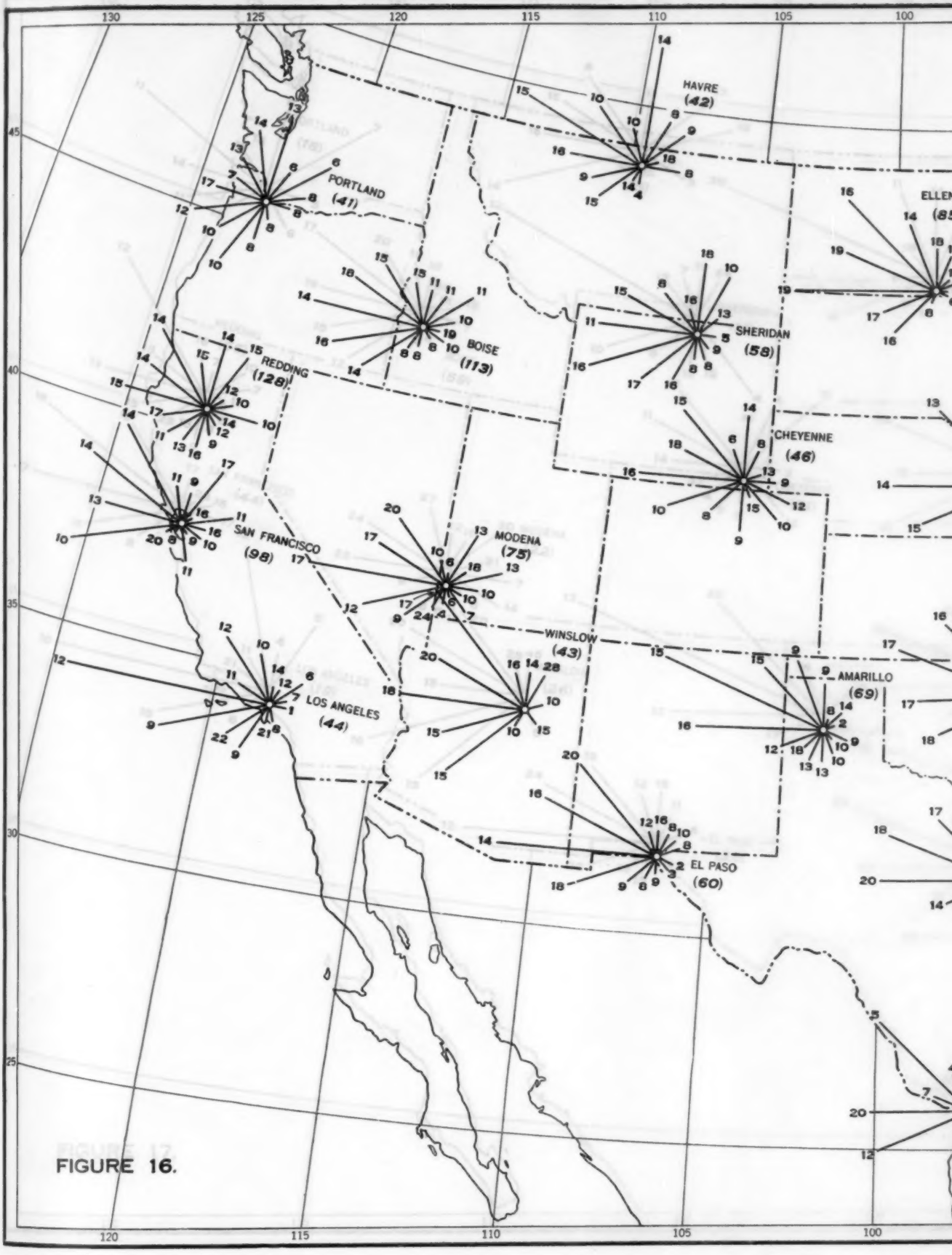
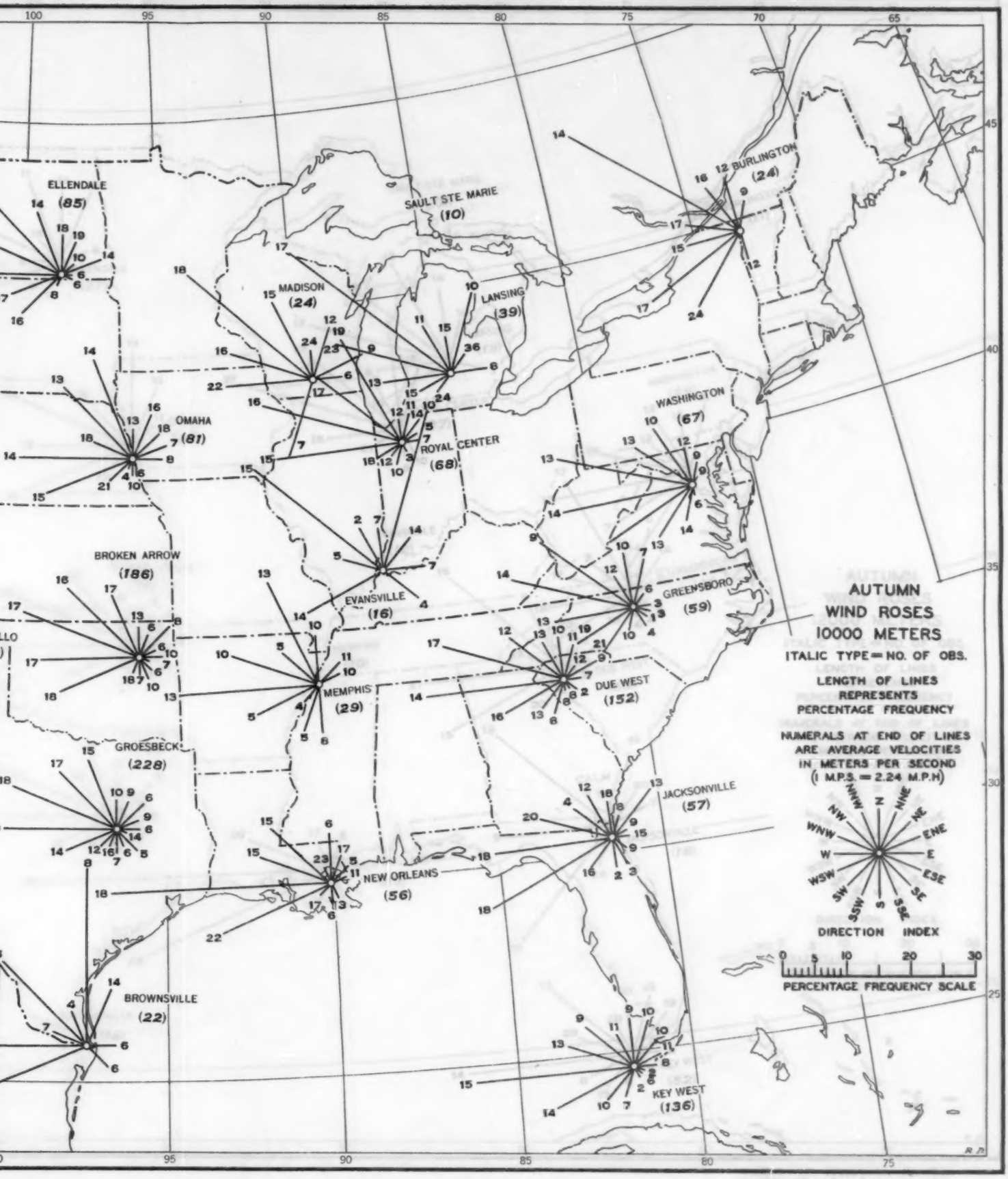

HAVRE
(42)
PORTLAND
(41)
BOISE
(113)
SHERIDAN
(58)
REDDING
(128)
CHEYENNE
(46)
SAN FRANCISCO
(98)
MODENA
(75)
WINSLOW
(43)
LOS ANGELES
(44)
AMARILLO
(69)
EL PASO
(60)

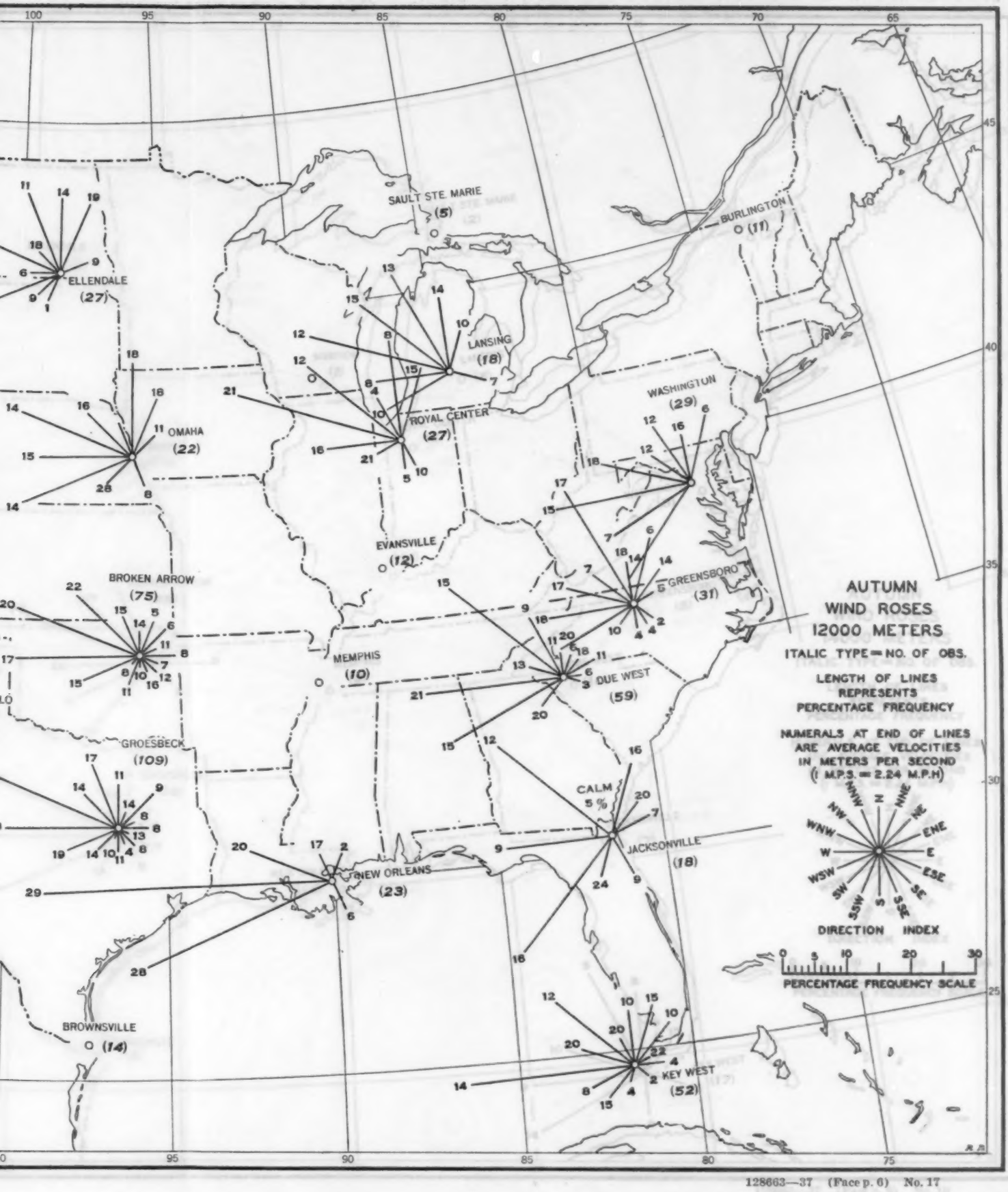
FIGURE 16.



128663—37 (Face p. 6) No. 16


PORTLAND
(18)
HAVRE
(15)
SHERIDAN
(16)
REDDING
(66)
BOISE
(59)
SAN FRANCISCO
(44)
CHEYENNE
(21)
MODENA
(22)
LOS ANGELES
(19)
WINSLOW
(26)
AMARILLO
(18)
EL PASO
(28)

FIGURE 17.



128663—37 (Face p. 6) No. 17


130
125
120
115
110
105
100
45
40
35
30
25
HAVRE
(2)
PORTLAND
(5)
BOISE
(5)
SHERIDAN
(3)
REDDING
(13)
CHEYENNE
(7)
SAN FRANCISCO
(20)
MODENA
(7)
LOS ANGELES
(5)
WINSLOW
(5)
AMARILLO
(1)
EL PASO
(0)
17
19
11
17
18
10
5
22
22
22
22
120
115
110
105
100

FIGURE 18.

128663—37 (Face p. 6) No. 18

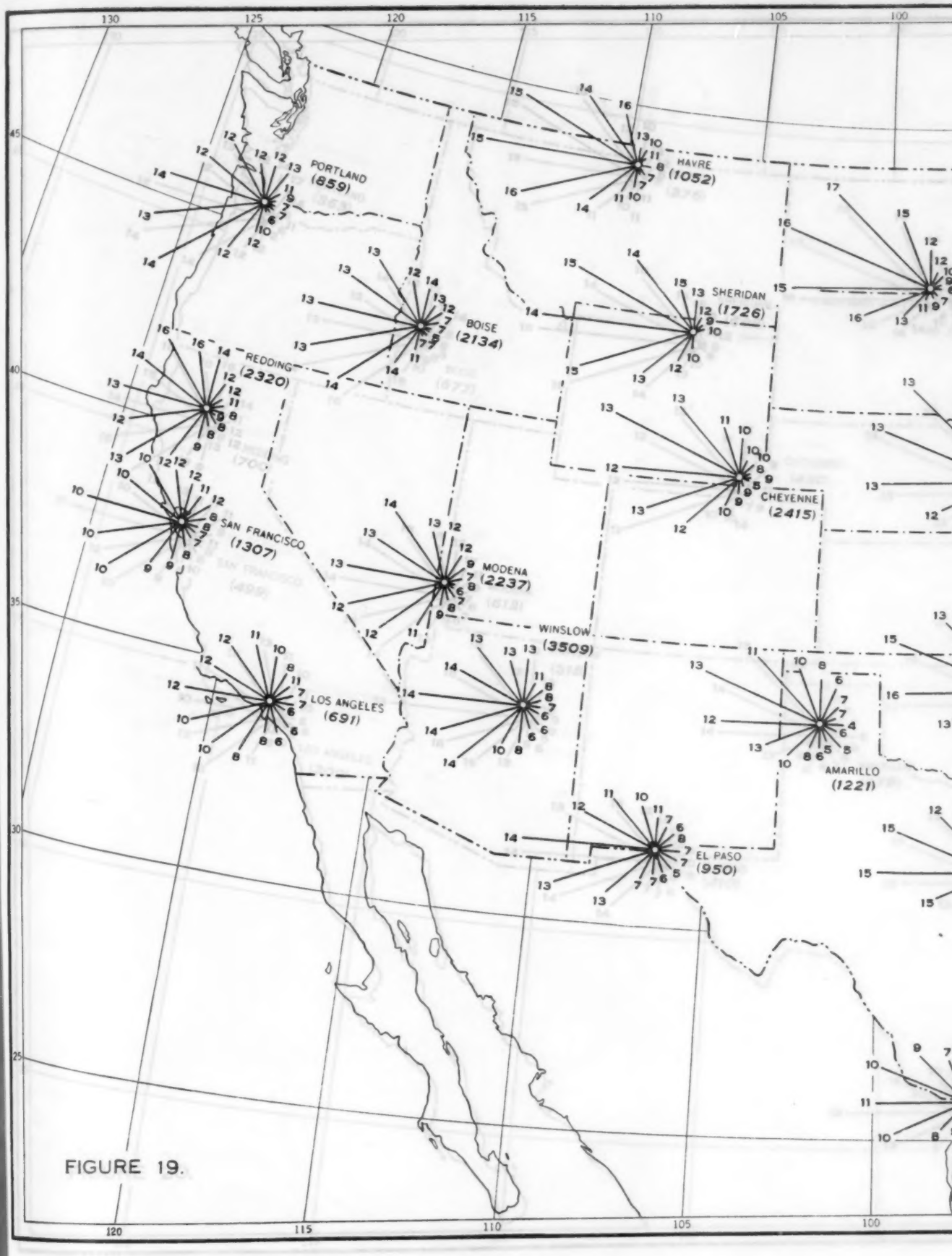
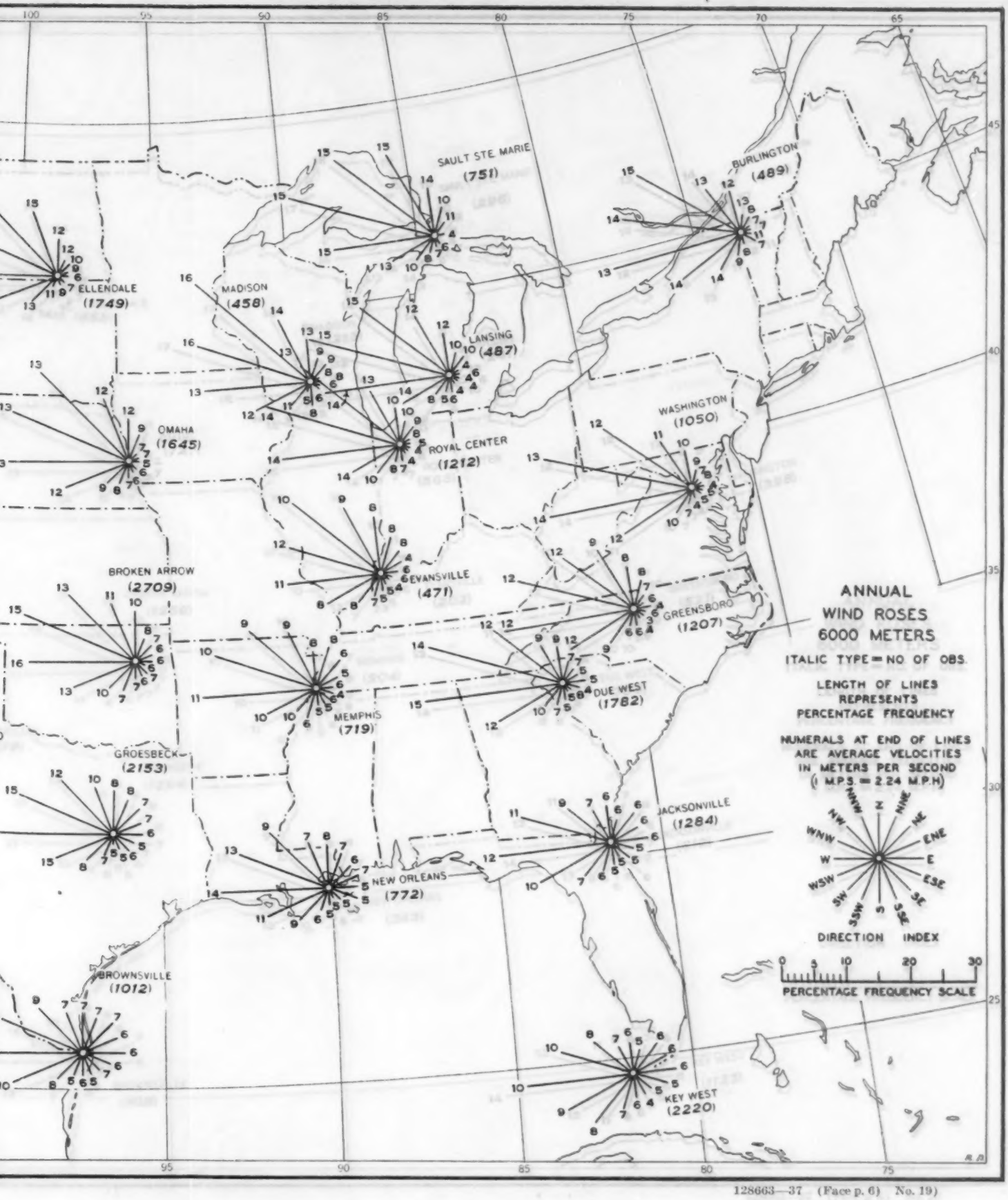

PORTLAND (859)
HAVRE (1052)
BOISE (2134)
SHERIDAN (1726)
REDDING (2320)
CHEYENNE (2415)
SAN FRANCISCO (1307)
MODENA (2237)
WINSLOW (3509)
LOS ANGELES (691)
AMARILLO (1221)
EL PASO (950)

FIGURE 19.



128663—37 (Face p. 6) No. 19)

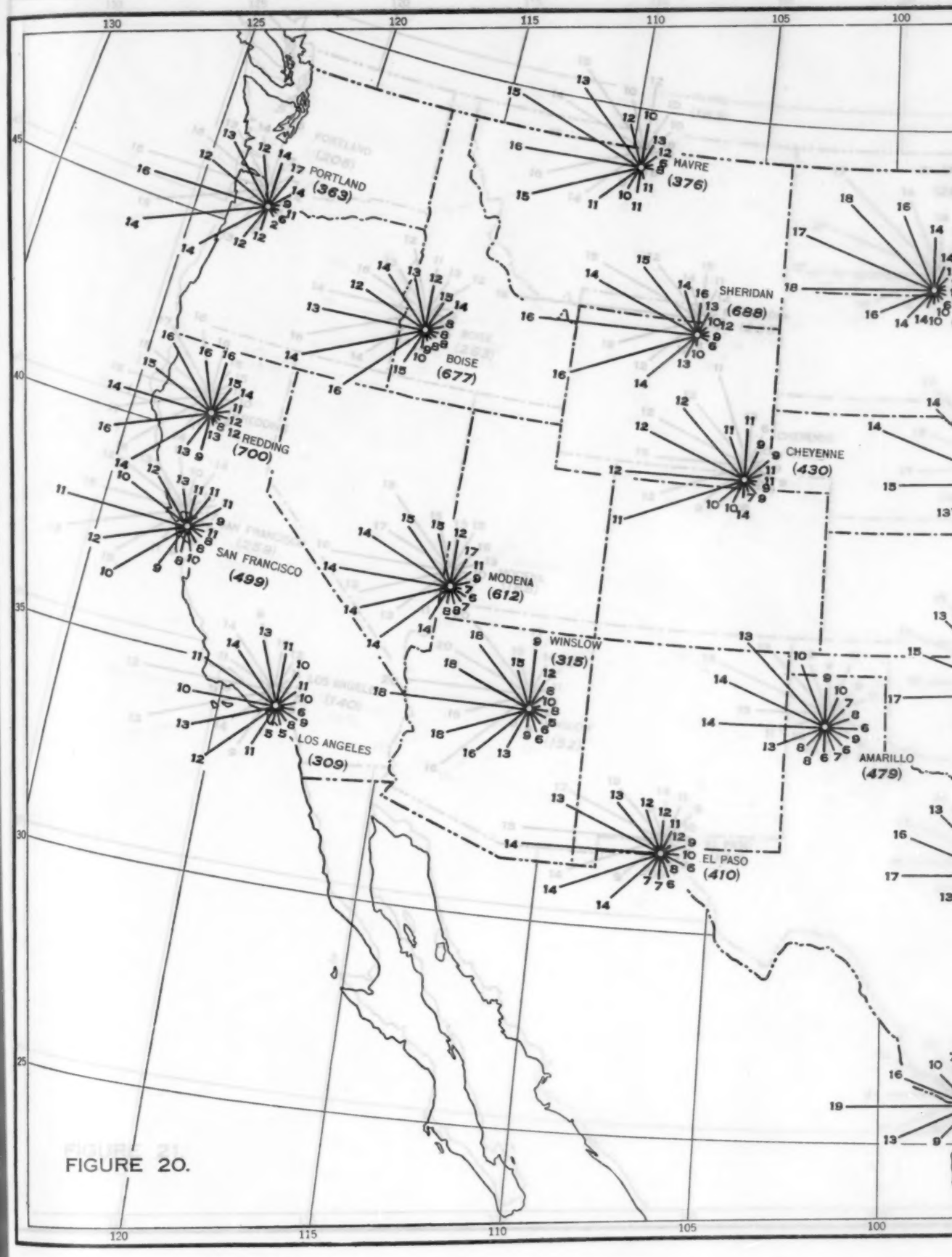
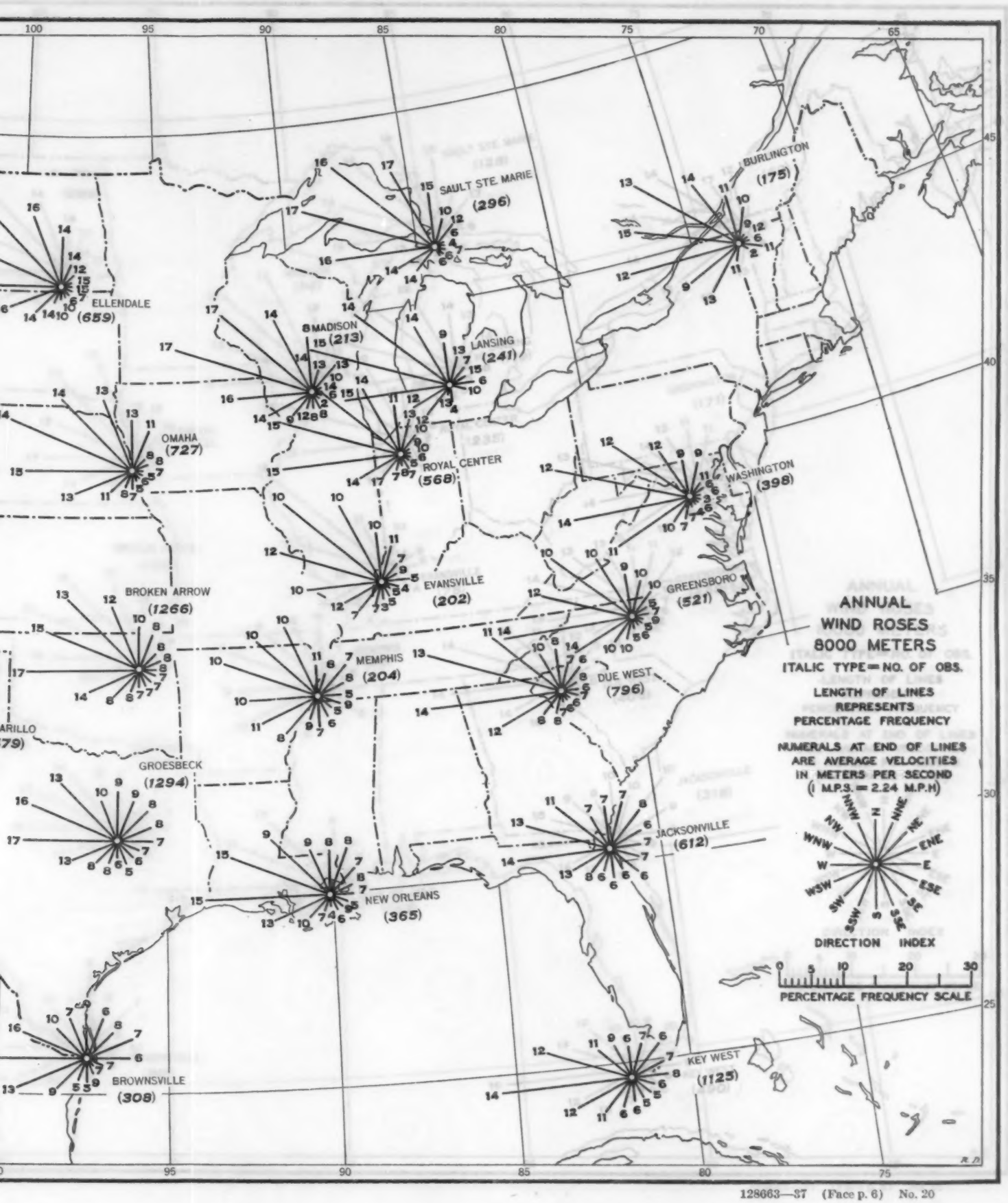

130
125
120
115
110
105
100
45
40
35
30
25
PORTLAND
(363)
HAVRE
(376)
SHERIDAN
(688)
BOISE
(677)
REDDING
(700)
CHEYENNE
(430)
SAN FRANCISCO
(499)
MODENA
(612)
WINSLOW
(315)
LOS ANGELES
(309)
AMARILLO
(479)
EL PASO
(410)
120
115
110
105
100

FIGURE 20.


ANNUAL
WIND ROSES
8000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H)
DIRECTION INDEX
PERCENTAGE FREQUENCY SCALE
SAULT STE. MARIE (296)
BURLINGTON (175)
ELLENDALE (659)
MADISON (213)
LANSING (241)
OMAHA (727)
ROYAL CENTER (568)
WASHINGTON (398)
EVANSVILLE (202)
GREENSBORO (521)
BROKEN ARROW (1266)
MEMPHIS (204)
DUE WEST (796)
GROESBECK (1294)
JACKSONVILLE (612)
NEW ORLEANS (365)
BROWNSVILLE (308)
KEY WEST (1125)

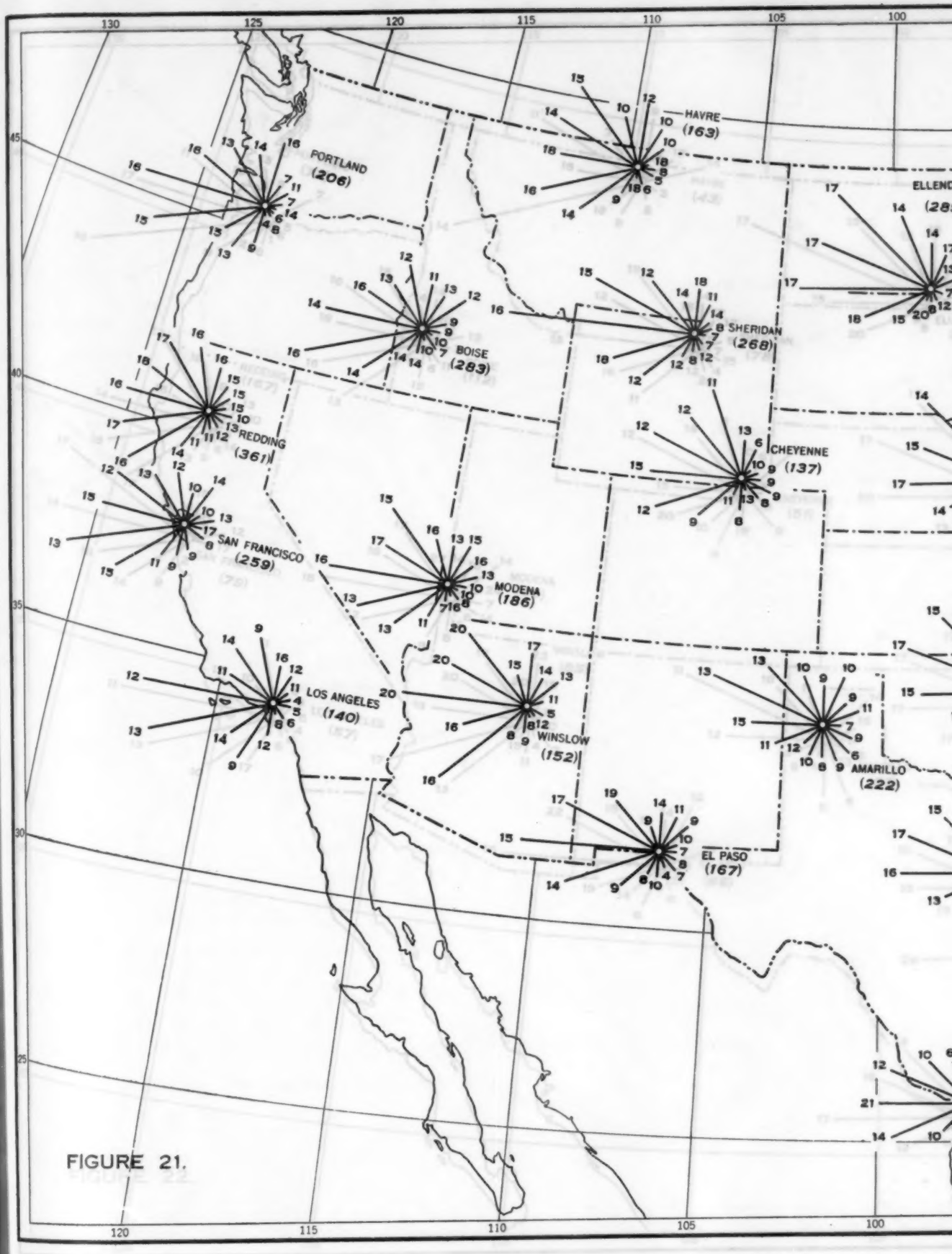
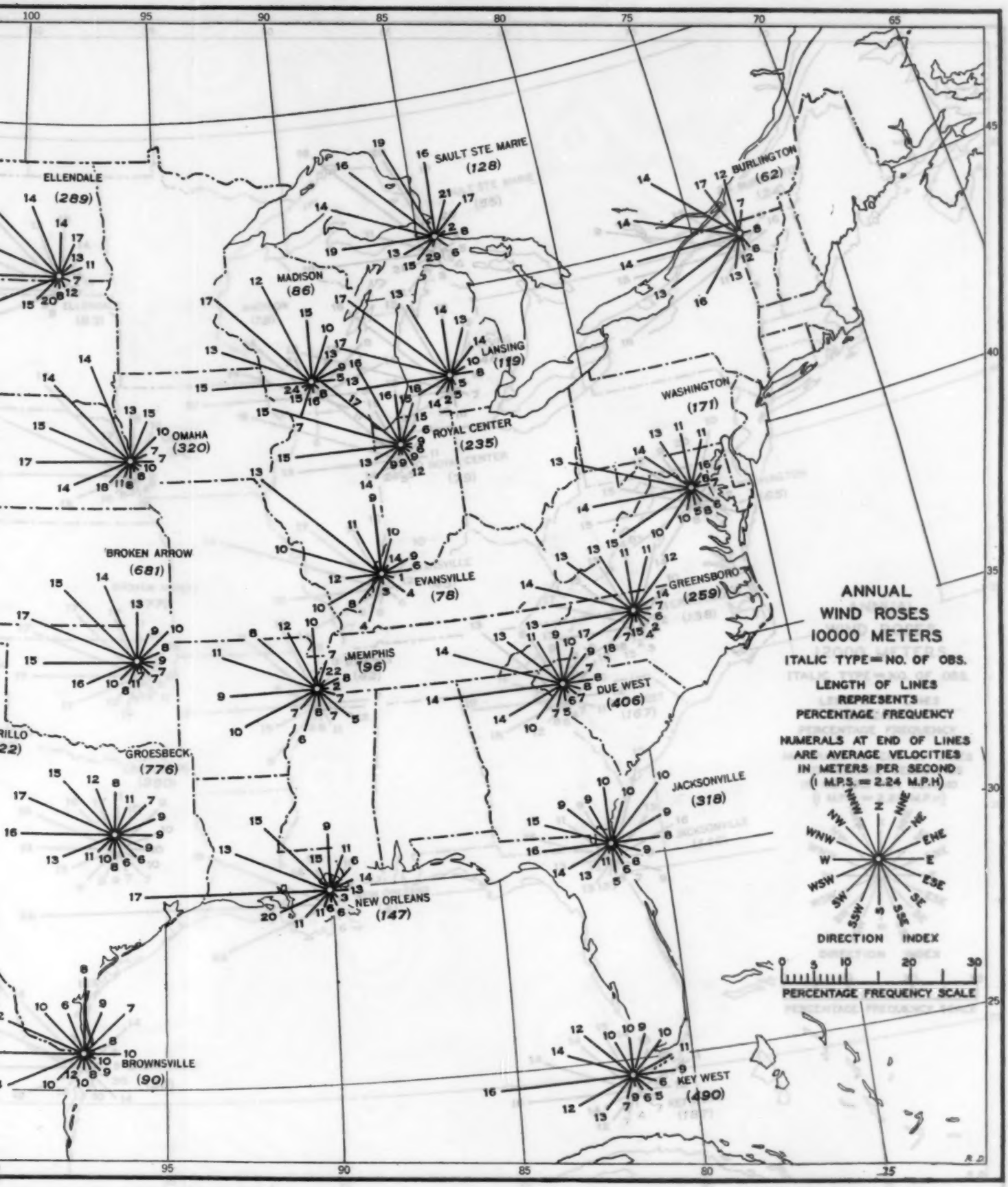
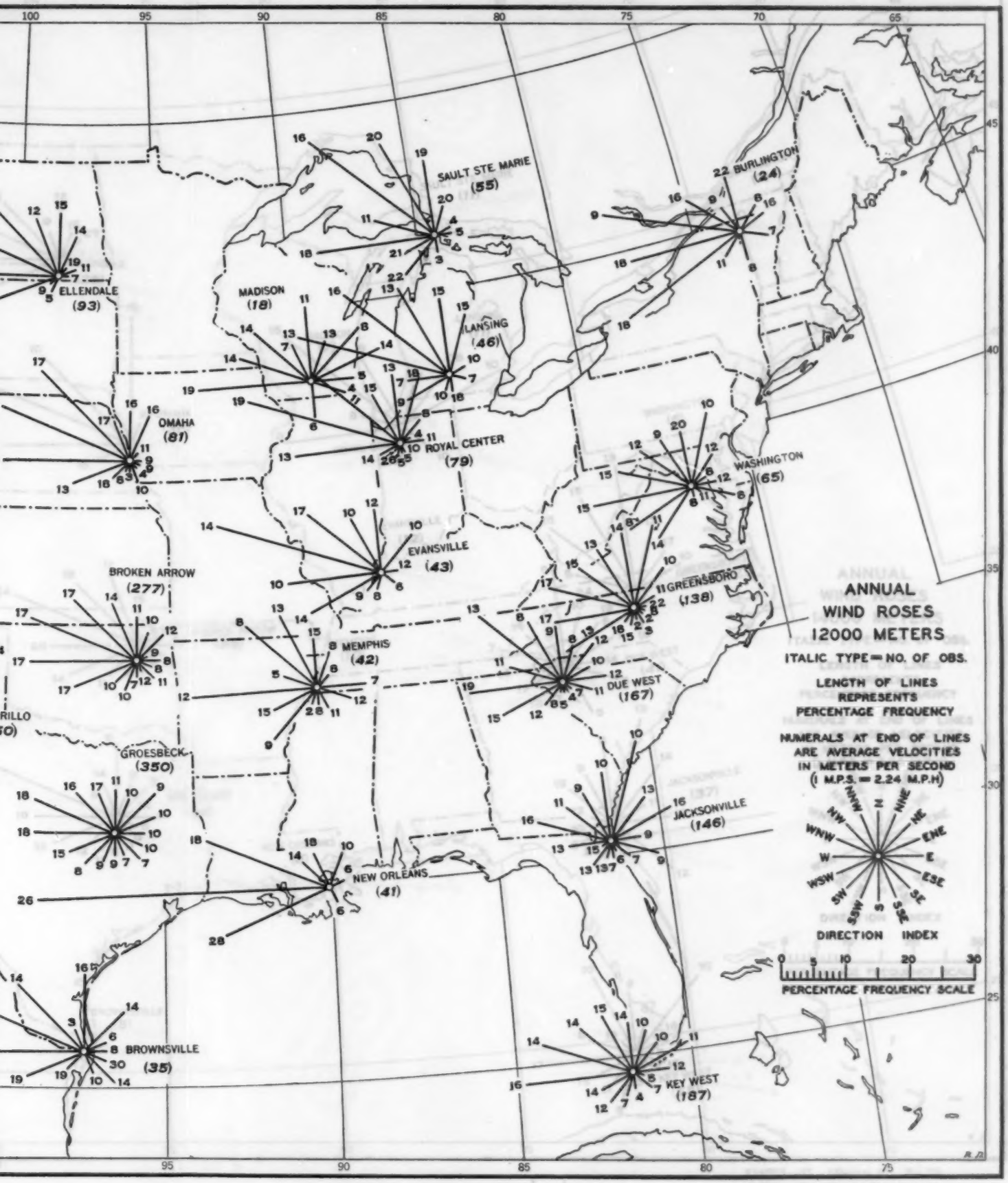

130
125
120
115
110
105
100
45
40
35
30
25
HAVRE
(163)
PORTLAND
(206)
BOISE
(283)
SHERIDAN
(268)
REDDING
(361)
CHEYENNE
(137)
SAN FRANCISCO
(259)
MODENA
(186)
LOS ANGELES
(140)
WINSLOW
(152)
AMARILLO
(222)
EL PASO
(167)
120
115
110
105
100

FIGURE 21.


ELLENDALE
(289)
SAULT STE. MARIE
(128)
BURLINGTON
(62)
MADISON
(86)
LANSING
(119)
OMAHA
(320)
ROYAL CENTER
(235)
WASHINGTON
(171)
BROKEN ARROW
(681)
EVANSVILLE
(78)
GREENSBORO
(259)
MEMPHIS
(96)
DUE WEST
(406)
GROESBECK
(776)
JACKSONVILLE
(318)
NEW ORLEANS
(147)
BROWNSVILLE
(90)
KEY WEST
(490)
ANNUAL
WIND ROSES
10000 METERS
ITALIC TYPE = NO. OF OBS.
LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY
NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H)
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DIRECTION INDEX
0 5 10 20 30
PERCENTAGE FREQUENCY SCALE
100
95
90
85
80
75
70
65
45
40
35
30
25


PORTLAND (72)
HAVRE (43)
REDDING (167)
BOISE (112)
SHERIDAN (78)
CHEYENNE (51)
SAN FRANCISCO (79)
MODENA (48)
WINSLOW (85)
LOS ANGELES (57)
AMARILLO (50)
EL PASO (68)

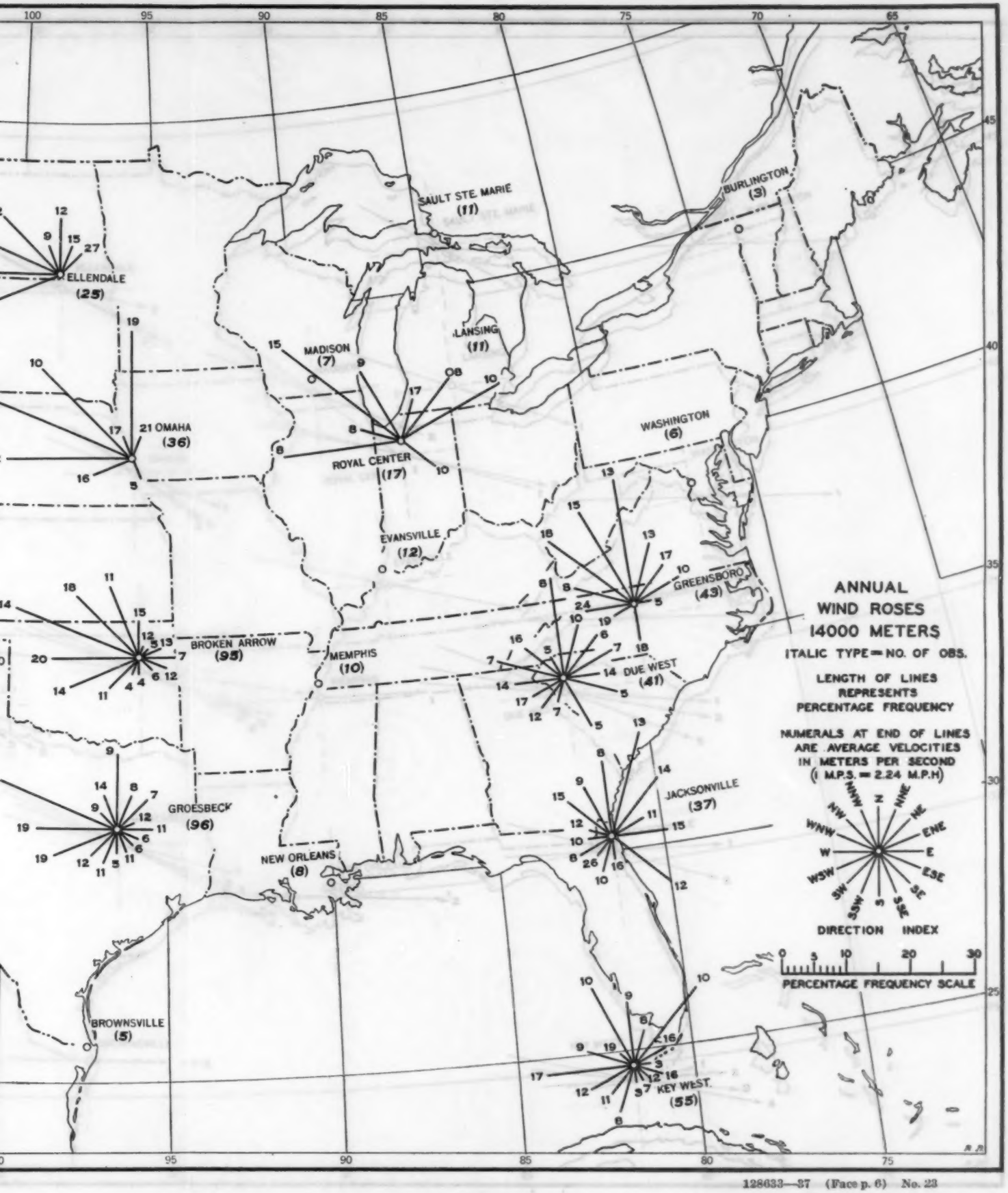
FIGURE 22.



128063—37 (Face p. 6) No. 22


130
125
120
115
110
105
100
45
40
35
30
25
PORTLAND (19)
HAVRE (4)
BOISE (11)
SHERIDAN (12)
REDDING (32)
CHEYENNE (9)
SAN FRANCISCO (28)
MODENA (13)
WINSLOW (27)
LOS ANGELES (12)
AMARILLO (13)
EL PASO (1)

FIGURE 23.



128633—37 (Face p. 6) No. 23

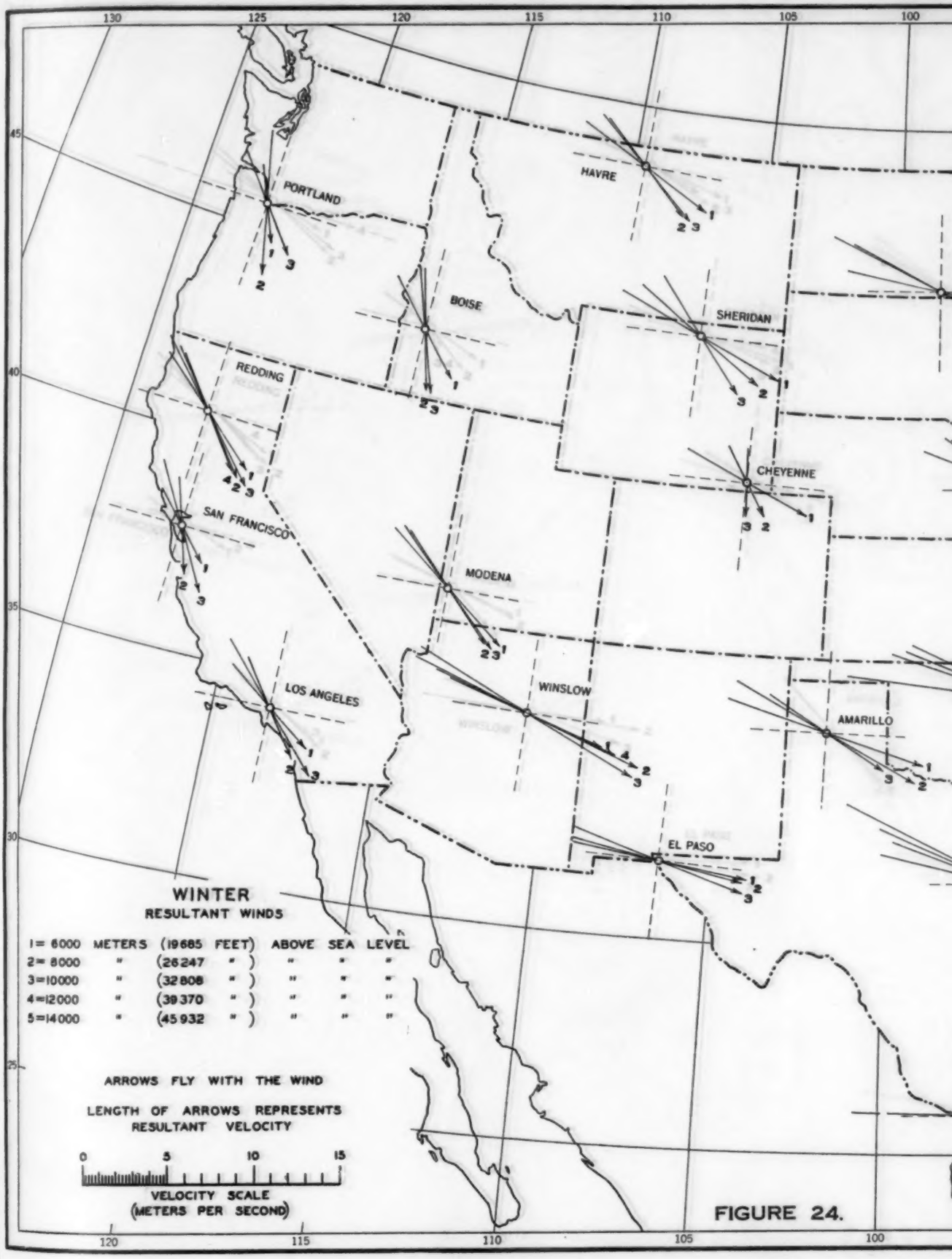
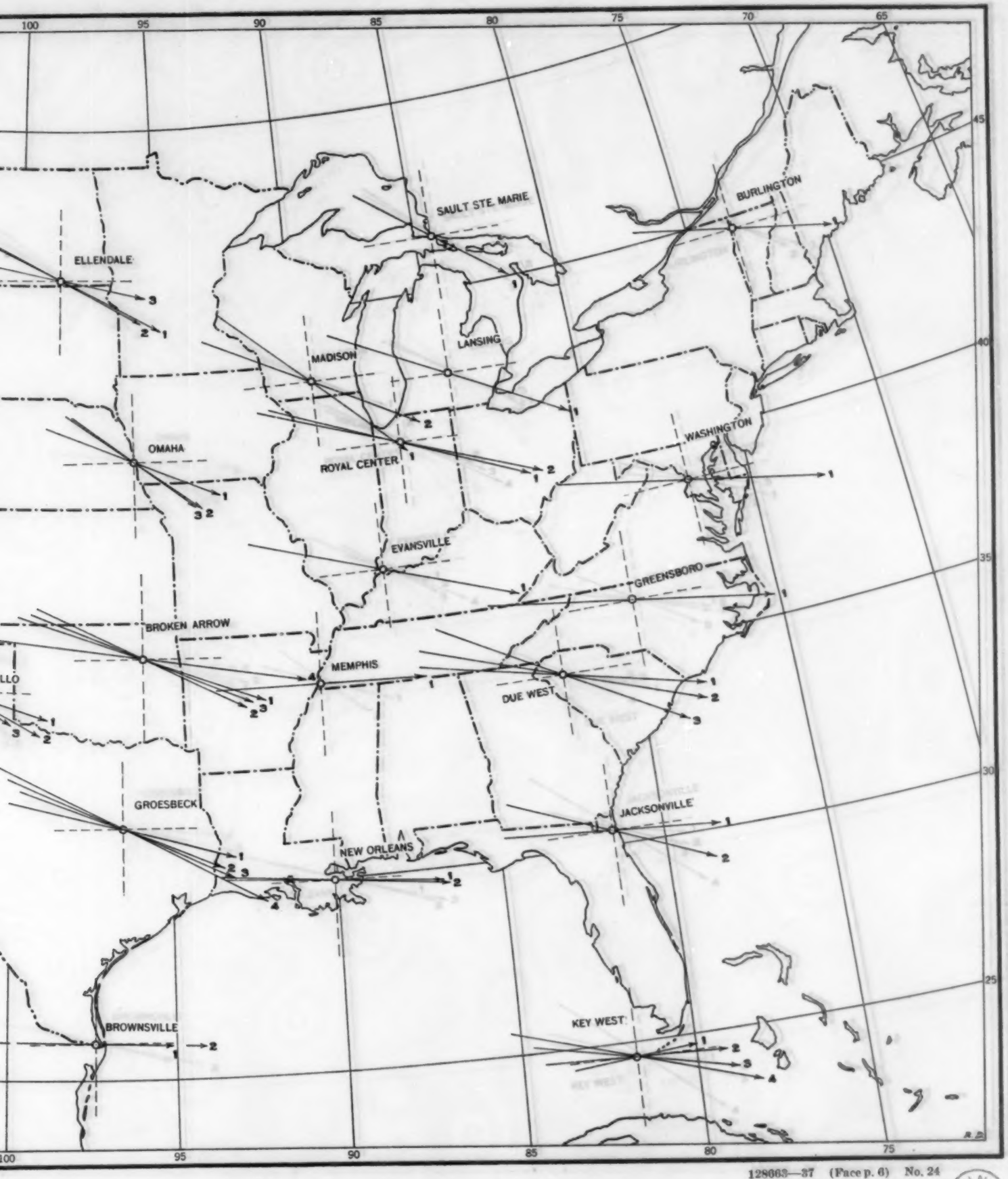

130
125
120
115
110
105
100
45
40
35
30
25
PORTLAND
HAVRE
BOISE
SHERIDAN
REDDING
CHEYENNE
SAN FRANCISCO
MODENA
LOS ANGELES
WINSLOW
AMARILLO
EL PASO
WINTER
RESULTANT WINDS
1= 6000 METERS (19685 FEET) ABOVE SEA LEVEL
2= 8000 " (26247 ") " " "
3=10000 " (32808 ") " " "
4=12000 " (39370 ") " " "
5=14000 " (45932 ") " " "
ARROWS FLY WITH THE WIND
LENGTH OF ARROWS REPRESENTS
RESULTANT VELOCITY
0 5 10 15
VELOCITY SCALE
(METERS PER SECOND)
120
115
110
105
100

FIGURE 24.



128063—37 (Face p. 6) No. 24

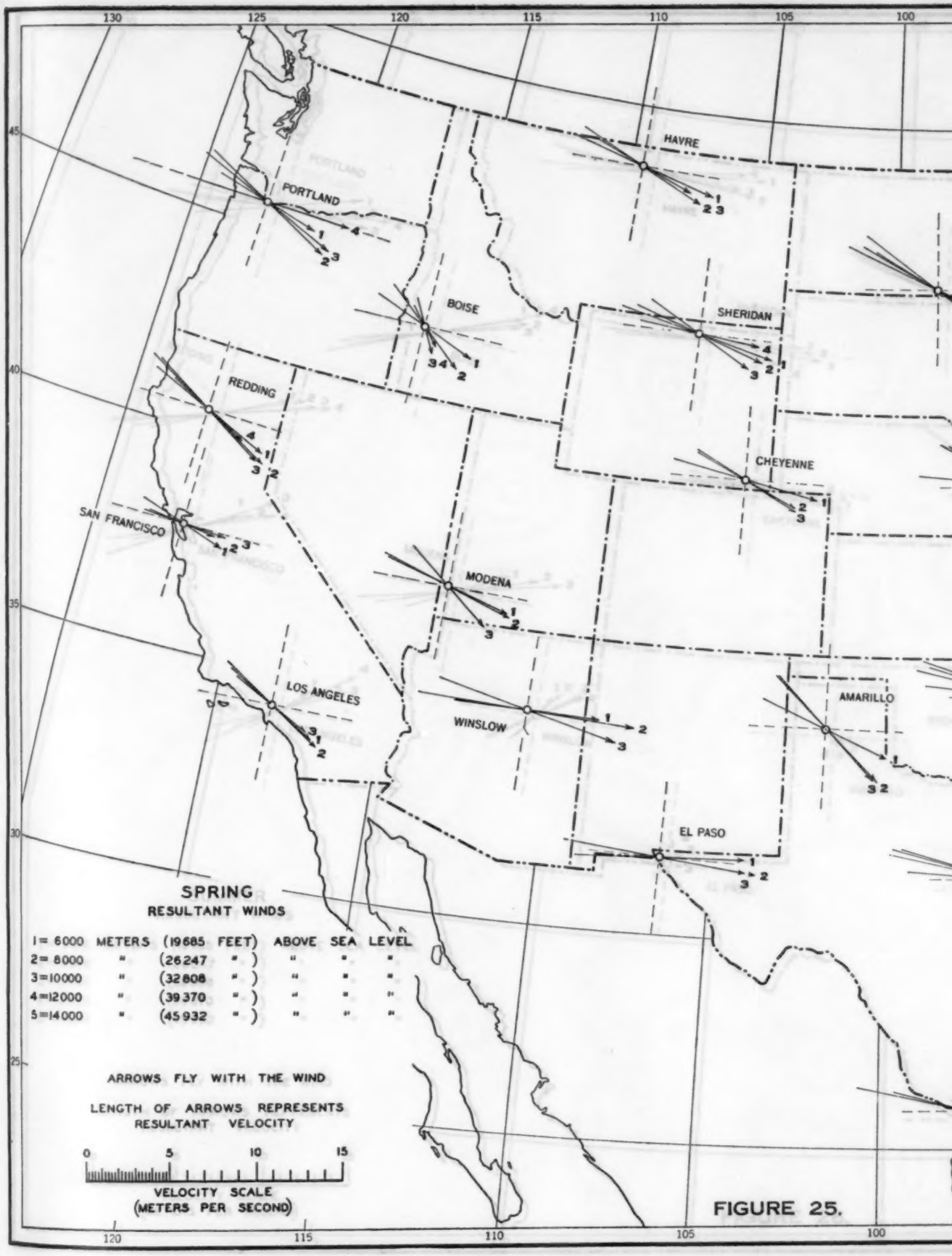
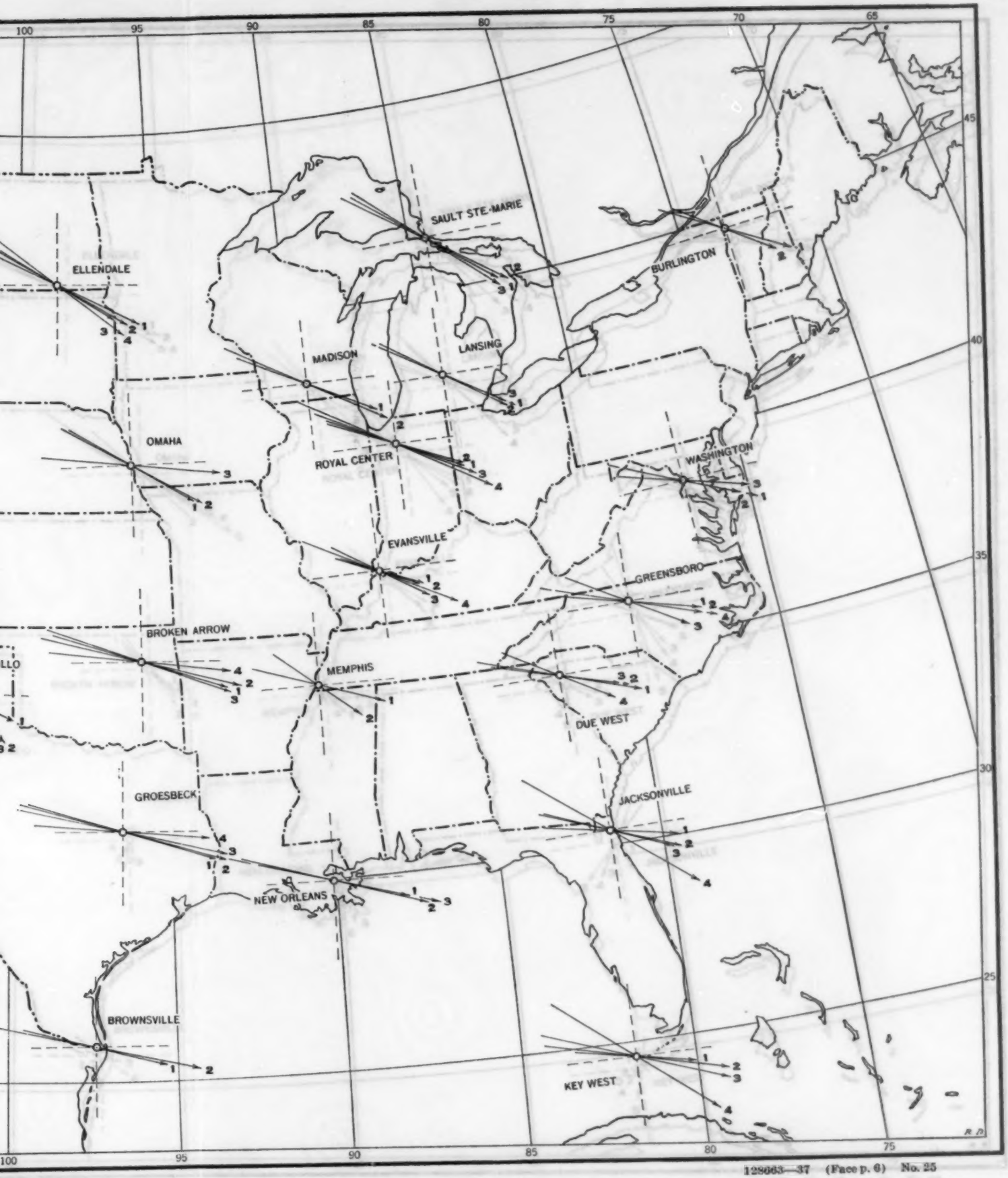

130
125
120
115
110
105
100
45
40
35
30
25
HAVRE
PORTLAND
BOISE
SHERIDAN
REDDING
CHEYENNE
SAN FRANCISCO
MODENA
LOS ANGELES
WINSLOW
AMARILLO
EL PASO
SPRING
RESULTANT WINDS
1= 6000 METERS (19685 FEET) ABOVE SEA LEVEL
2= 8000 " (26247 ") " " "
3=10000 " (32808 ") " " "
4=12000 " (39370 ") " " "
5=14000 " (45932 ") " " "
ARROWS FLY WITH THE WIND
LENGTH OF ARROWS REPRESENTS RESULTANT VELOCITY
0 5 10 15
VELOCITY SCALE
(METERS PER SECOND)
120
115
110
105
100

FIGURE 25.



128063—37 (Face p. 6) No. 25

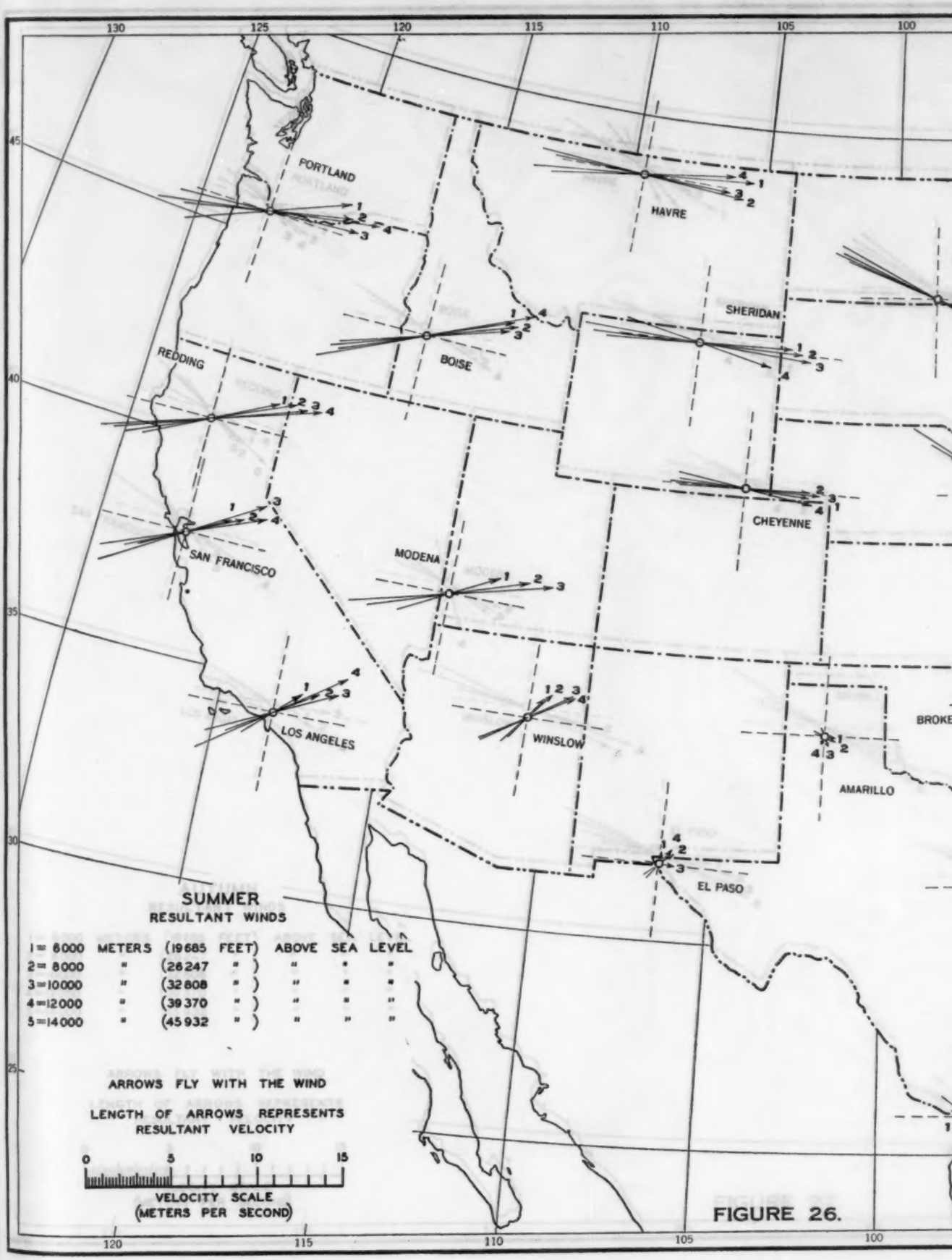
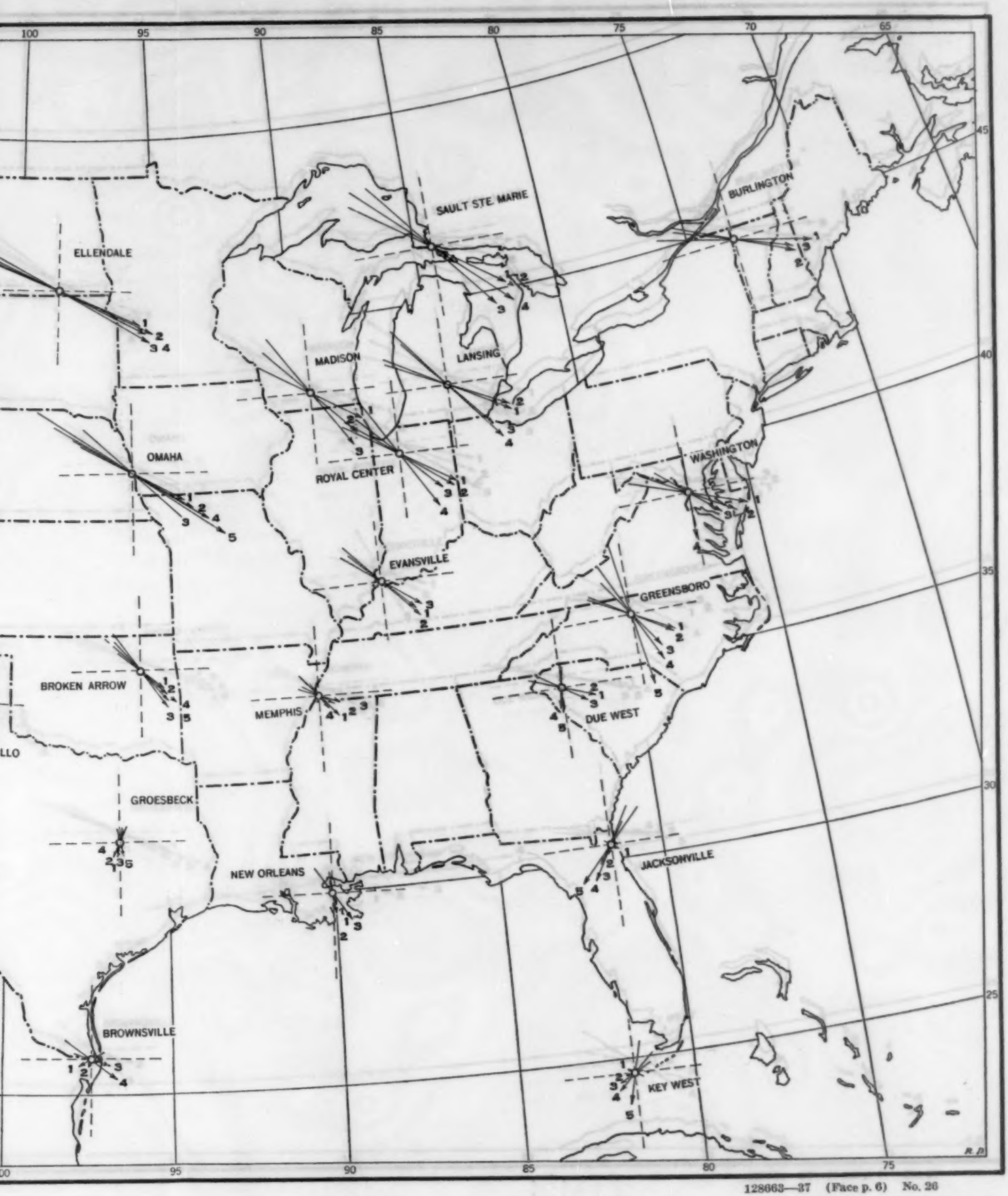

130
125
120
115
110
105
100
45
40
35
30
25
PORTLAND
HAVRE
SHERIDAN
BOISE
REDDING
CHEYENNE
SAN FRANCISCO
MODENA
LOS ANGELES
WINSLOW
AMARILLO
EL PASO
SUMMER
RESULTANT WINDS
1= 6000 METERS (19685 FEET) ABOVE SEA LEVEL
2= 8000 " (26247 ") " " "
3=10000 " (32808 ") " " "
4=12000 " (39370 ") " " "
5=14000 " (45932 ") " " "
ARROWS FLY WITH THE WIND
LENGTH OF ARROWS REPRESENTS
RESULTANT VELOCITY
0 5 10 15
VELOCITY SCALE
(METERS PER SECOND)
120
115
110
105
100

FIGURE 26.



128663—37 (Face p. 6) No. 26

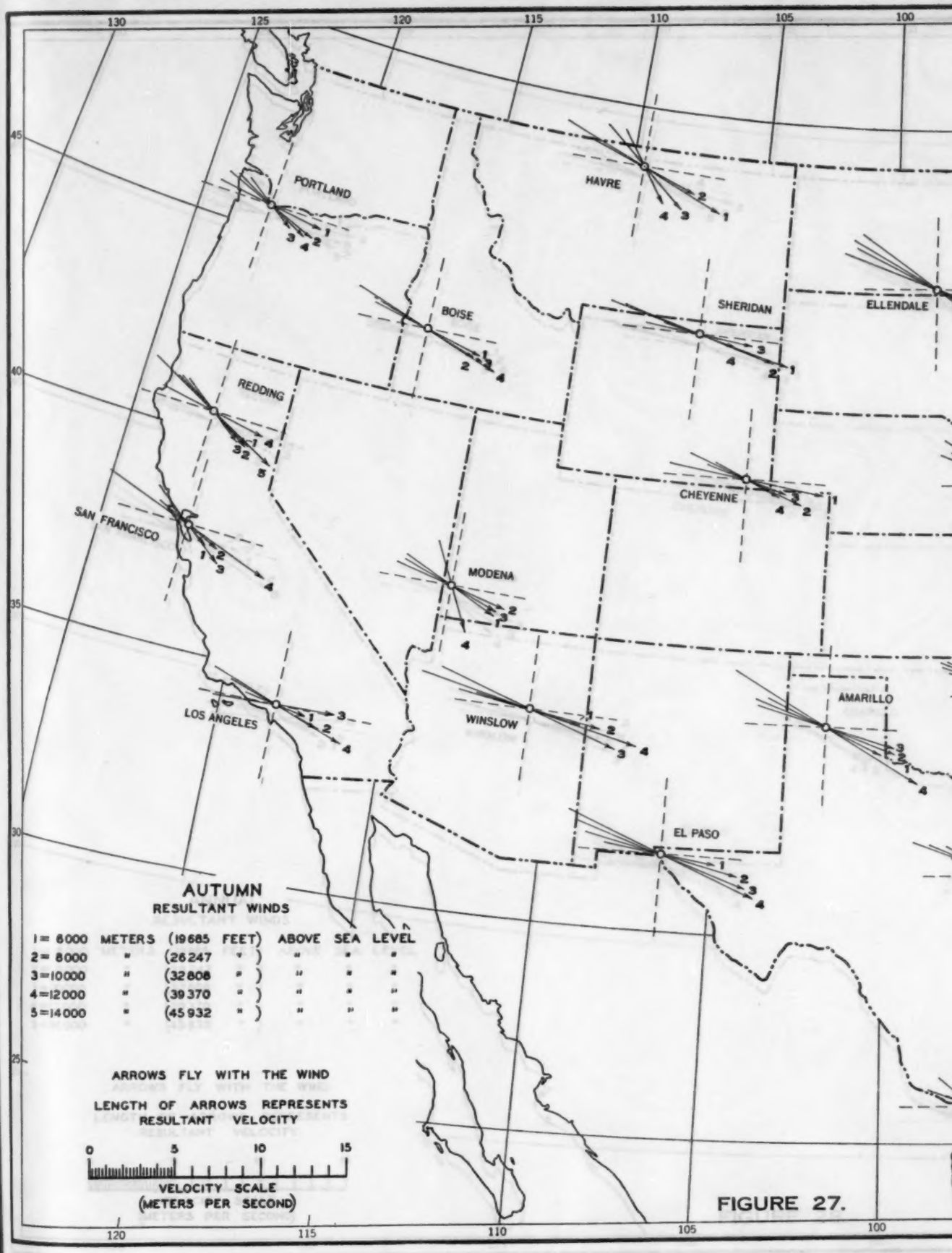

130
125
120
115
110
105
100
45
40
35
30
25
PORTLAND
HAVRE
BOISE
SHERIDAN
ELLENDALE
REDDING
CHEYENNE
SAN FRANCISCO
MODENA
LOS ANGELES
WINSLOW
AMARILLO
EL PASO
AUTUMN
RESULTANT WINDS
1= 6000 METERS (19685 FEET) ABOVE SEA LEVEL
2= 8000 " (26247 ") " " "
3=10000 " (32808 ") " " "
4=12000 " (39370 ") " " "
5=14000 " (45932 ") " " "
ARROWS FLY WITH THE WIND
LENGTH OF ARROWS REPRESENTS RESULTANT VELOCITY
0 5 10 15
VELOCITY SCALE
(METERS PER SECOND)
120
115
110
105
100

FIGURE 27.

128663—37 (Face p. 6) No. 27

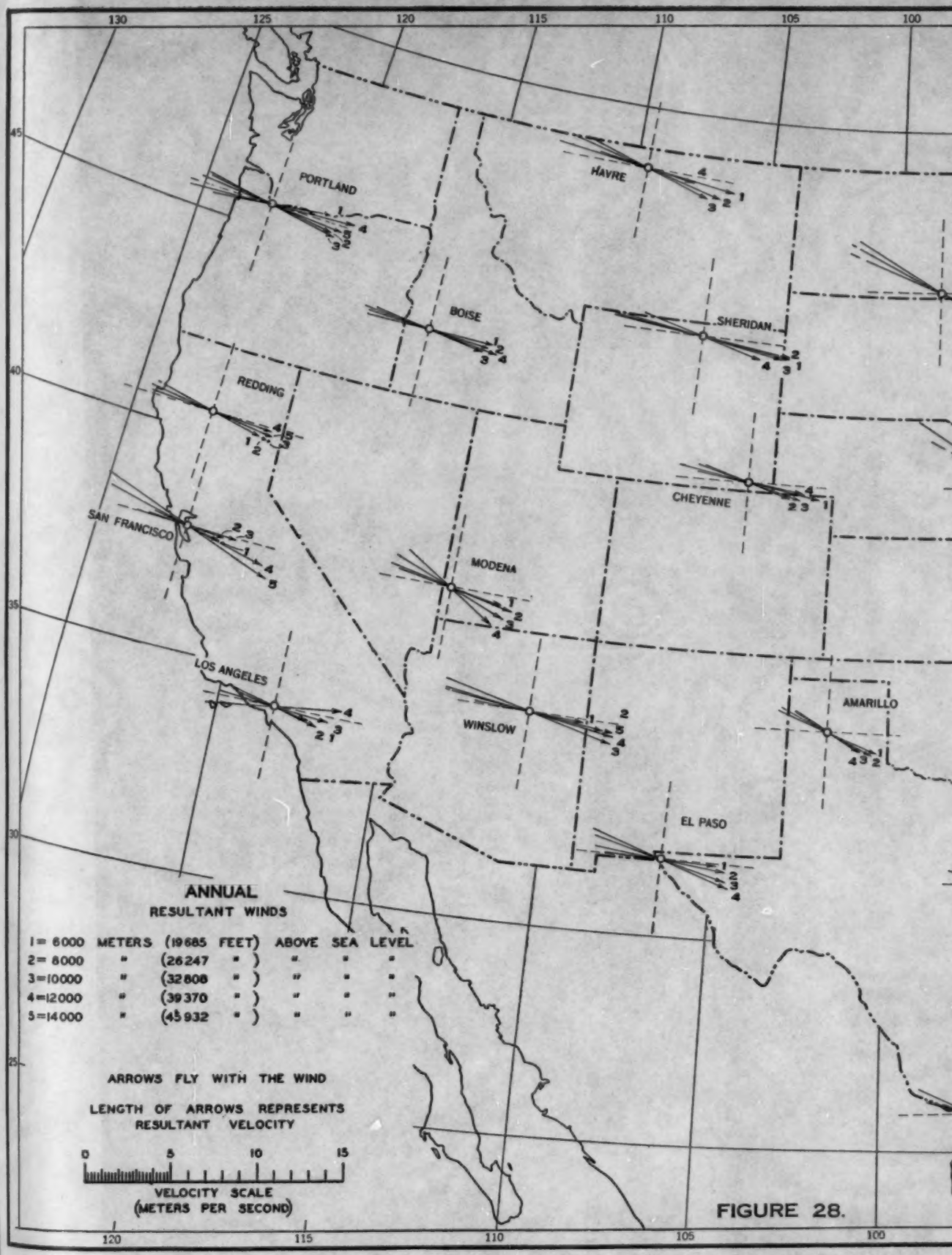

130
125
120
115
110
105
100
45
40
35
30
25
PORTLAND
HAVRE
BOISE
SHERIDAN
REDDING
CHEYENNE
SAN FRANCISCO
MODENA
LOS ANGELES
WINSLOW
AMARILLO
EL PASO
ANNUAL
RESULTANT WINDS
1= 6000 METERS (19685 FEET) ABOVE SEA LEVEL
2= 8000 " (26247 ") " " "
3=10000 " (32808 ") " " "
4=12000 " (39370 ") " " "
5=14000 " (45932 ") " " "
ARROWS FLY WITH THE WIND
LENGTH OF ARROWS REPRESENTS
RESULTANT VELOCITY
0 5 10 15
VELOCITY SCALE
(METERS PER SECOND)
120
115
110
105
100

FIGURE 28.

128663—37 (Face p. 6) No. 28

T

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

N.
E.
S.
W.

TABLE 3.—*Annual percentage frequency of wind directions from each of the 4 quadrants: North winds include NNW., N., NNE., and ½ (NW.+NE.); east winds include ENE., E., ESE., and ½ (NE.+SE.); south winds include SSE., S., SSW., and ½ (SE.+SW.), and west winds include WSW., W., WNW., and ½ (SW.+NW.)*—Continued

EL PASO, TEX.

Quadrant	6 km	8 km	10 km	12 km	14 km
N	19	18	20	24	
E	11	9	10	9	
S	16	14	13	13	
W	54	59	57	54	

EVANSVILLE, IND.

N	34	36	34	29	
E	9	9	11	6	
S	9	10	13	5	
W	48	45	42	60	

GREENSBORO, N. C.

N	27	30	34	42	56
E	6	8	12	9	12
S	8	7	9	6	5
W	59	55	45	43	27

GROESBECK, TEX.

N	26	28	25	25	25
E	15	18	20	21	15
S	10	11	12	15	15
W	49	43	43	39	45

HAVRE, MONT.

N	18	23	31	17	
E	2	3	7	13	
S	12	11	12	10	
W	68	63	50	60	

JACKSONVILLE, FLA.

N	20	27	30	41	45
E	16	19	26	27	24
S	13	14	11	8	15
W	50	40	33	24	16

KEY WEST, FLA.

N	17	20	23	30	36
E	20	18	20	19	19
S	17	14	10	9	15
W	46	48	47	42	30

LANSING, MICH.

N	29	31	39	45	
E	5	8	7	4	
S	7	6	7	4	
W	59	55	47	47	

LOS ANGELES, CALIF.

N	24	27	23	17	
E	11	9	6	6	
S	23	17	19	16	
W	42	47	52	61	

MADISON, WIS.

N	32	35	43	34	
E	5	6	10	27	
S	6	8	7	5	
W	57	51	40	34	

MEMPHIS, TENN.

N	29	27	28	32	
E	10	14	9	13	
S	11	15	16	12	
W	50	43	47	43	

TABLE 3.—*Annual percentage frequency of wind directions from each of the 4 quadrants: North winds include NNW., N., NNE., and ½ (NW.+NE.); east winds include ENE., E., ESE., and ½ (NE.+SE.); south winds include SSE., S., SSW., and ½ (SE.+SW.), and west winds include WSW., W., WNW., and ½ (SW.+NW.)*—Continued

MODENA, UTAH.

Quadrant	6 km	8 km	10 km	12 km	14 km
N	25	24	25	21	
E	6	7	10	17	
S	19	16	14	13	
W	50	53	51	49	

NEW ORLEANS, LA.

N	26	29	24	12	
E	15	11	8	2	
S	10	8	8	2	
W	49	52	60	84	

OMAHA, NEBR.

N	30	32	28	30	34
E	3	6	9	3	0
S	8	7	7	7	3
W	59	55	46	60	63

PORTLAND, OREG.

N	20	25	25	17	22
E	5	5	6	5	5
S	21	14	16	11	16
W	54	55	53	67	57

REDDING, CALIF.

N	25	25	26	23	27
E	7	8	9	9	3
S	23	18	19	17	20
W	46	49	46	51	50

ROYAL CENTER, IND.

N	28	33	35	38	35
E	5	5	6	6	26
S	8	7	8	4	3
W	59	55	51	52	36

SAN FRANCISCO, CALIF.

N	22	21	22	15	17
E	10	10	10	8	3
S	22	19	18	12	11
W	46	50	50	65	69

SAULT STE. MARIE, MICH.

N	35	37	42	43	
E	2	6	8	4	
S	6	3	4	6	
W	57	54	45	47	

SHERIDAN, WYO.

N	19	20	19	22	
E	1	3	5	11	
S	11	9	12	11	
W	69	68	64	56	

WASHINGTON, D. C.

N	24	26	28	34	
E	4	6	6	14	
S	5	7	12	6	
W	67	61	54	46	

WINSLOW, ARIZ.

N	22	23	24	21	15
E	9	7	7	4	11
S	21	17	15	17	13
W	48	53	54	58	61

From an examination of the table it will be noted that, for the year as a whole, westerly winds predominate at all stations and all levels except Jacksonville at the 12- and 14-kilometer levels, Key West at the 14-kilometer level, and Madison at the 10-kilometer level, where northerly winds prevail. Northerly winds are next in frequency, except as noted above, with southerly winds next, and easterly winds least frequent except at the southernmost stations of Due West, Jacksonville, Key West, New Orleans, Groesbeck, and Brownsville, where easterly winds are more frequent than southerly winds.

The table also shows that, on the average, between 70 and 80 percent of the winds at all levels and for all stations are from the north and west quadrants. It appears, also, that the annual percentage frequency of westerly winds reaches a maximum at 5 or 6 kilometers, except over the extreme south, southwest, and Pacific coast regions, where the frequency of westerly winds increases up to 8 kilometers at most stations and up to 10 or 12 kilometers at others.

RESULTANT WINDS

Resultant winds, based on the same records used in computing the wind roses, are shown graphically in figures 24 to 28, inclusive. In computing these data each individual wind observation is handled as a vector, and in arriving at the final results these vectors are combined into a single vector, or value, representing the resultant or mass movement of the air. For example, a north wind of 12 meters per second, when combined with a south wind of 8 meters per second, will give a resultant wind of north 4 meters per second, which is the mass movement of air as measured by these two observations. Resultants are of most value, of course, when based on a large number of frequent observations. They can be used to advantage for long-time planning of air-line schedules and in the study of the general circulation of the atmosphere.

It will be noted that, for the year as a whole, there is remarkably close agreement in both the direction and velocity of the resultant winds between levels and between adjoining stations. With a very few exceptions, the annual resultant directions fall between W. and NW. at all stations and at all levels. The exceptions are: NNW. at Madison and N. at Jacksonville at 12 kilometers, and NNW. at Greensboro and Royal Center and NNE. at Jacksonville at 14 kilometers. The resultant velocities for the year, as a whole, average about 10 meters per second for the northern part of the country, decreasing to about 6 meters per second over the extreme southern part. For the individual seasons the greatest variations from the annual values occur during the winter and summer. During the winter season there is a marked increase in resultant velocities at most stations, especially over the eastern part of the country where the average is approximately 16 meters per second at 6 and 8 kilometers. Above 8 kilometers there is a decrease in velocity over the northern part of the country, but a continued increase up to the 14-kilometer level over the extreme southern part. The former is apparently due to the fact that the base of the stratosphere is reached at 8 or 9 kilometers over that part of the country during this season, above which a decrease in mass air movement is to be expected. As the tropopause slopes upward rather steeply from north to south during this season (reaching a level of about 15 kilometers at latitude 25° north), it is also to be expected that the average air movement should increase in velocity up to the 14-kilometer level over the southern portion of the country. During the summer season lighter resultant velocities prevail over all sections and at all levels, except at the lower levels over the northern Rocky Mountain region where they are generally greater than during the winter season. This is apparently due to the fact that the tropopause is considerably higher over this region in summer than in winter. The increase in velocity, consequently extends to higher levels during the summer season. The resultant directions, during the summer season, shift to SW. or WSW. over the western Rocky Mountain and Pacific coast regions and to N. or NE. over the southeastern part of the country. This circulation indicates the existence of a high-level anticyclone, located approximately over the State of Texas. The existence of this anticyclonic circulation at high level was brought out in an article published by Thomas R. Reed, of the San Francisco, Calif., Weather Bureau office.[1] The statement made by him in that article, to the effect that there were indications of this anticyclone extending up to the tropopause, is verified by the present study. It is interesting to note that Shaw [2] also shows a center of high pressure at about the same location in his computed normal-pressure map for 8 kilometers for the month of July.

AVERAGE VELOCITIES

In table 4 average velocities are shown for each station by levels and seasons. These values are obtained without regard to wind direction by dividing the velocity totals for all directions by the corresponding number of observations.

TABLE 4.—*Average velocities in meters per second (obtained by dividing total velocity of all directions by total number of observations). One meter per second is equivalent to 2.24 miles per hour*

Altitude (meters)	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
	AMARILLO, TEX.					BOISE, IDAHO				
6,000	15.4	11.5	5.9	10.5	9.9	13.1	12.1	13.3	12.2	12.7
8,000	17.6	10.7	7.3	12.4	10.8	12.3	12.3	14.7	12.8	13.5
10,000	15.8	12.2	8.5	13.2	11.0	10.4	10.6	15.2	13.8	13.6
12,000	(1)	(1)	9.2	15.0	11.3	(1)	13.6	16.5	15.3	15.1
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	BROKEN ARROW, OKLA.					BROWNSVILLE, TEX.				
6,000	19.9	14.8	7.7	11.9	11.9	12.4	11.5	5.9	7.7	8.3
8,000	18.4	15.8	9.2	13.4	12.4	16.8	15.4	7.1	9.9	10.1
10,000	20.3	15.7	10.7	14.7	13.3	(1)	(1)	9.5	9.7	11.2
12,000	23.8	16.1	11.5	15.4	14.2	(1)	(1)	18.8	(1)	15.4
14,000	(1)	(1)	10.9	14.8	13.6	(1)	(1)	(1)	(1)	(1)
	BURLINGTON, VT.					CHEYENNE, WYO.				
6,000	15.1	13.3	13.0	12.4	13.1	12.6	12.4	10.5	13.1	12.0
8,000	(1)	12.6	11.8	12.5	12.2	10.7	11.2	10.8	11.8	11.2
10,000	(1)	(1)	12.4	15.8	13.5	8.2	10.5	11.8	12.4	11.3
12,000	(1)	(1)	(1)	(1)	14.4	(1)	(1)	10.2	11.6	12.2
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	DUE WEST, S. C.					ELLENDALE, N. DAK.				
6,000	20.3	13.4	7.7	11.2	11.4	17.9	15.5	13.6	15.8	15.2
8,000	20.9	11.7	8.4	11.8	11.0	16.5	15.8	16.4	16.2	16.2
10,000	20.0	11.4	8.9	13.0	11.3	14.6	13.4	17.3	16.5	16.0
12,000	(1)	11.6	9.4	14.7	12.1	(1)	14.0	16.1	15.6	15.4
14,000	(1)	(1)	8.4	(1)	9.2	(1)	(1)	(1)	(1)	13.8
	EL PASO, TEX.					EVANSVILLE, IND.				
6,000	14.6	12.6	6.8	10.3	10.9	19.1	9.4	8.3	9.6	9.3
8,000	15.5	13.7	8.4	12.6	12.3	(1)	8.8	9.9	9.5	9.6
10,000	16.4	13.9	8.5	14.5	13.1	(1)	10.0	9.2	10.2	9.7
12,000	(1)	(1)	8.0	15.5	14.4	(1)	12.4	(1)	(1)	12.5
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)

[1] Less than 15 observations.

[1] Reed, Thomas R. The North American High-Level Anticyclone—Monthly Weather Review, November 1933, pp. 321–325.

[2] Sir Napier Shaw, Manual of Meteorology, vol. II, fig. 167, p. 262.

TABLE 4.—*Average velocities in meters per second (obtained by dividing total velocity of all directions by total number of observations). One meter per second is equivalent to 2.24 miles per hour*—Continued

Altitude (meters)	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
	GREENSBORO, N. C.					GROESBECK, TEX.				
6,000	20.6	11.6	8.9	10.1	10.5	17.8	14.7	6.2	10.2	10.7
8,000	(1)	13.2	10.0	10.6	11.1	18.1	15.8	7.1	12.1	11.2
10,000	(1)	14.0	11.8	12.0	12.6	20.4	15.7	8.6	14.2	12.0
12,000	(1)	16.0	12.6	13.7	13.7	25.2	13.1	9.4	16.6	12.8
14,000	(1)	(1)	15.0	(1)	14.9	(1)	(1)	9.4	18.3	13.0
	HAVRE, MONT.					JACKSONVILLE, FLA.				
6,000	13.3	13.7	15.1	14.6	14.5	16.2	11.1	5.7	8.8	8.5
8,000	12.2	13.1	14.4	12.4	13.4	16.3	12.4	7.0	10.8	9.5
10,000	11.4	12.6	15.1	12.3	13.4	(1)	11.6	9.2	14.3	10.7
12,000	(1)	(1)	13.3	12.5	12.0	(1)	15.1	10.7	12.8	11.6
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	11.5	(1)	12.3
	KEY WEST, FLA.					LANSING, MICH.				
6,000	10.5	10.0	5.1	6.6	7.7	20.0	13.2	10.9	13.7	12.9
8,000	14.0	13.8	6.0	9.2	9.9	(1)	12.5	12.6	13.8	13.1
10,000	15.8	14.8	8.7	11.4	11.6	(1)	12.8	13.3	16.2	14.1
12,000	19.6	15.6	9.3	12.9	12.8	(1)	(1)	15.2	11.9	13.1
14,000	(1)	(1)	10.2	10.7	11.2	(1)	(1)	(1)	(1)	(1)
	LOS ANGELES, CALIF.					MADISON, WIS.				
6,000	12.8	10.7	7.4	10.0	9.9	17.8	13.8	11.3	14.9	13.4
8,000	12.8	11.7	9.4	11.6	11.1	19.5	14.9	11.8	17.6	14.6
10,000	14.4	10.2	11.5	11.4	11.7	(1)	(1)	12.4	14.0	13.3
12,000	(1)	(1)	12.6	11.2	11.4	(1)	(1)	(1)	(1)	12.1
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	MEMPHIS, TENN.					MODENA, UTAH.				
6,000	16.6	11.2	7.1	9.1	8.8	13.9	12.8	9.2	11.6	11.6
8,000	(1)	11.2	7.7	10.1	9.1	14.1	13.0	12.6	13.6	13.3
10,000	(1)	(1)	7.6	10.1	8.9	15.4	12.0	15.0	14.1	14.2
12,000	(1)	(1)	8.6	12.4	10.1	(1)	(1)	(1)	17.5	15.4
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	NEW ORLEANS, LA.					OMAHA, NEBR.				
6,000	15.4	12.4	6.1	9.4	9.4	15.6	12.2	9.9	12.7	11.7
8,000	15.7	14.1	7.6	11.6	10.9	16.4	13.9	11.8	12.7	12.7
10,000	(1)	16.0	10.0	16.2	14.0	16.6	15.1	12.8	13.9	13.7
12,000	(1)	(1)	(1)	25.0	22.1	(1)	(1)	16.0	16.1	15.2
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	17.4	(1)	17.8
	PORTLAND, OREG.					REDDING, CALIF.				
6,000	12.2	12.1	13.0	12.3	12.6	15.5	13.2	12.0	12.2	13.1
8,000	14.4	14.1	13.5	12.4	13.5	17.2	14.7	14.3	12.8	14.4
10,000	14.8	15.6	14.0	10.7	13.8	17.4	16.1	16.2	13.7	15.5
12,000	(1)	12.2	16.2	9.8	13.4	14.4	13.9	15.9	12.9	14.2
14,000	(1)	(1)	(1)	(1)	14.0	(1)	(1)	(1)	(1)	13.3
	ROYAL CENTER, IND.					SAN FRANCISCO, CALIF.				
6,000	19.5	13.3	10.7	13.2	12.5	11.3	10.4	8.8	10.3	10.0
8,000	21.6	13.7	12.0	14.3	13.4	12.0	9.4	11.0	10.5	10.7
10,000	(1)	14.7	13.5	15.6	14.7	13.8	10.0	13.9	12.8	12.9
12,000	(1)	15.6	13.7	13.9	14.3	(1)	(1)	14.8	16.8	15.6
14,000	(1)	(1)	(1)	(1)	10.8	(1)	(1)	(1)	15.6	15.2
	SAULT STE. MARIE, MICH.					SHERIDAN, WYO.				
6,000	14.7	14.2	13.8	13.7	13.9	15.2	13.5	13.2	14.9	13.9
8,000	(1)	16.0	15.1	13.8	15.2	14.0	13.1	15.1	14.9	14.5
10,000	(1)	16.3	16.7	(1)	16.2	14.9	12.0	16.2	13.6	14.6
12,000	(1)	(1)	18.1	(1)	17.0	(1)	12.4	14.7	12.0	13.9
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	WASHINGTON, D. C.					WINSLOW, ARIZ.				
6,000	19.3	12.2	10.3	12.0	11.8	16.3	13.2	7.5	11.3	12.1
8,000	(1)	10.7	9.9	12.1	11.1	20.6	16.8	7.5	14.0	15.1
10,000	(1)	12.5	11.3	12.7	12.2	20.9	18.6	10.0	17.0	16.6
12,000	(1)	(1)	11.7	12.6	12.3	18.4	(1)	11.5	18.3	16.4
14,000	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	17.4

[1] Less than 15 observations.

In general, it will be noted that the variation of average velocity with height and with latitude is approximately the same as previously pointed out in the discussion of wind roses and resultants. The *annual* variations with latitude from south to north are approximately 8 to 15 meters per second at 6 kilometers, 10 to 16 meters per second at 8 kilometers, 11 to 16 meters per second at 10 kilometers, and 13 to 15 meters per second at 12 kilometers. At 14 kilometers there are hardly enough data available to indicate accurately the latitudinal trend at that level. During the winter season, however, there appears to be no regular change in velocity with latitude but rather a concentration of high velocities over the area between 35° to 40° north latitude and 80° to 90° west longitude, the average being 21 or 22 meters per second at 8 kilometers. Above 8 kilometers the number of observations available are not sufficient to locate this area accurately, but it appears to shift toward the southwest with altitude, the average velocity at 12 kilometers being 25.2 meters per second at Groesbeck and 23.8 meters per second at Broken Arrow. This season is also characterized by decreasing average velocity with height over the northern part of the Rocky Mountain and Western Plateau regions, as previously pointed out. This is shown by the records for Ellendale, Havre, Boise, Sheridan, and Cheyenne, the combined averages for the five stations being 14.4, 13.1, and 11.9 meters per second for 6, 8, and 10 kilometers, respectively. Except over the region just mentioned, highest average velocities occur during the winter season and lowest during the summer season, the seasonal range being greatest over the more southern latitudes.

It is interesting to note in this connection that the average wind velocities obtained herein and their variation with height and latitude agree closely with the computed wind speeds presented in "Physikalische Hydrodynamik Mit Anwendung Auf Die Dynamische Meteorologie".[2]

FREQUENCY OF HIGH VELOCITIES

The percentage frequencies of high velocities between 22 and 27 meters per second (49–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), together with the highest velocities on record, are shown in considerable detail in table 5 for 6, 8, and 10 kilometers.

It will be seen that high velocities occur most frequently with westerly winds. Over the western Rocky Mountain and Pacific coast regions, however, they also occur consistently with directions between N. and E., especially during the winter season. This is probably due to outflowing air from deep, high-pressure areas which move down from western Canada southward along the eastward slope of the Rocky Mountains. In general, there is a decided seasonal variation in the frequency of high velocities at these levels, the maximum occurring during the winter season and the minimum during the summer season. Over the north portion of the Rocky Mountains, however, the reverse is true, as in the case of average velocities previously discussed. Most stations show an increase in the frequency of high velocities between the 6- and 10-kilometer levels. This is more pronounced in summer than in winter.

In table 6 the total (all directions combined) annual percentage frequencies of high velocities are shown with the stations grouped according to geographical location. Mean values are also given for each of the three groups of stations. The mean values were computed from the original data and are not, therefore, averages of the columns under which they appear.

[2] "Physikalische Hydrodynamik Mit Anwendung Auf Die Dynamische Meteorologie" by: V. Bjerknes, J. Bjerknes, H. Solberg, and T. Bergeron, p. 649.

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*

AMARILLO, TEX.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N						1.3						
NNE	0.4					1.3						
NE												
ENE										4.4		
E												
ESE												
SE												
SSE												
S												
SSW	.4											
SW	.4	0.8	0.4	40								
WSW	3.1	1.6	0.4		2.6	1.3	1.3	40				
W	2.0	1.6			3.9	2.6					4.4	37
WNW	5.0	2.0			6.5				4.4			
NW	2.0	.4			3.9	3.9						
NNW	.4											
Total	13.7	6.4	0.8		16.9	10.4	1.3		4.4	4.4	4.4	

SPRING

N					2.2							
NNE	0.6											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.6	0.6		35								
WSW	1.2	.6										
W	2.4	.6							6.7			22
WNW	1.8	.6										
NW					2.2			23				
NNW												
Total	6.6	2.4			4.4				6.7			

SUMMER

N												
NNE									0.9			
NE												
ENE									.9			23
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW									.9			
W									.9			
WNW					0.5	0.5		31				
NW	0.2			23								
NNW												
Total	.2				.5	.5			3.6			

AUTUMN

N	0.3											
NNE	.3											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.3											
WSW		0.3	0.3	37	1.4							
W	.3				2.1	0.7		34	4.2			
WNW	.9	.6			2.8				1.4	2.8		32
NW	.3				1.4				1.4			
NNW	.9	.3			0.7							
Total	3.3	1.2	.3		8.4	.7			7.0	2.8		

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

BOISE, IDAHO

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	1.5	1.0	1.0	30		1.8		36		4.5		29
NNE	1.5	1.0			1.8							
NE	1.0	.5	.5			1.8						
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.5											
SW	2.0											
WSW	.5											
W	.5											
WNW	.5											
NW	2.0	1.0			1.8	1.8						
NNW	.5											
Total	10.5	3.5	1.5		3.6	5.4				4.5		

SPRING

N	0.4	0.6			2.0							
NNE	.4				1.0							
NE							1.0	37	4.6			27
ENE												
E												
ESE												
SE												
SSE					1.0							
S		.2										
SSW	.2											
SW												
WSW	1.2	.4			1.0							
W		.4				1.0						
WNW	.8	.2										
NW	1.8	.2	0.2	37	2.0							
NNW	.8	.2										
Total	5.6	2.2	.2		7.0	1.0	1.0		4.6			

SUMMER

N						0.4						
NNE					0.4							
NE									1.0			
ENE												
E					.4							
ESE												
SE												
SSE												
S	0.1									1.0		
SSW	.6	0.5	0.1		1.6	.4				2.0		34
SW	1.8	.4			6.0	.8			3.0	1.0		
WSW	1.7	.1	.1	44	5.2	.8		36	9.0	3.0		
W	1.2	.2			1.2	1.6			3.0	1.0		
WNW	1.1	.1	.1		.8	.8			1.0			
NW		.1			.4							
NNW					.4				1.0			
Total	6.5	1.4	.3		16.4	4.8			18.0	8.0		

AUTUMN

N	0.6	0.4	0.2	41		0.4			0.9			
NNE					0.4	.8	0.4	49				
NE	.6	.2			1.2				.9			
ENE									.9			
E												
ESE												
SE												
SSE												
S												
SSW	.4	.2	.2			.4						
SW	.8	.6			.4	.4			.9			
WSW	.8	.4			1.2				.9	1.8	0.9	35
W	2.4	.4			2.0	.8			1.8	.9		
WNW	1.0	.4	.2		.4				.9	3.6		
NW	1.0	1.4			.4	.4	.4		1.8			
NNW	.6	.8				.4				.9		
Total	8.2	4.8	.6		6.0	3.6	.8		9.0	7.2	.9	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

BROKEN ARROW, OKLA.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	0.6	0.4	0.2	------	------	0.7	------	------	1.5	------	------	------
NNE	------	.2	------	------	------	------	------	------	------	------	------	------
NE	------	------	------	------	------	------	------	------	------	------	------	------
ENE	------	------	------	------	------	------	------	------	------	------	------	------
E	------	------	------	------	------	------	------	------	------	------	------	------
ESE	------	------	------	------	------	------	------	------	------	------	------	------
SE	------	------	------	------	------	------	------	------	------	------	------	------
SSE	------	------	------	------	------	------	------	------	------	------	------	------
S	------	------	------	------	------	------	------	------	------	1.5	------	------
SSW	------	------	------	------	------	------	------	------	------	------	------	------
SW	.4	.4	.2	------	.7	------	------	------	------	------	------	------
WSW	2.4	2.0	------	------	.7	.7	------	------	------	1.5	1.5	------
W	4.8	4.4	1.2	50	3.5	2.8	2.8	50	1.5	1.5	1.5	40
WNW	3.8	3.0	.4	------	3.5	2.8	------	------	4.5	------	1.5	------
NW	2.8	2.6	------	------	4.2	2.1	1.4	------	------	3.0	------	------
NNW	.8	.4	------	------	------	.7	------	------	------	1.5	------	------
Total	15.6	13.4	2.0	------	12.6	9.8	4.2	------	7.5	9.0	4.5	------

SPRING

N	0.2	------	------	------	------	------	------	------	------	------	------	------
NNE	------	------	------	------	1.0	------	------	------	------	------	------	------
NE	.2	------	------	------	------	------	------	------	------	------	------	------
ENE	------	------	------	------	------	------	------	------	------	------	------	------
E	------	------	------	------	------	------	------	------	------	------	------	------
ESE	------	------	------	------	------	------	------	------	------	------	------	------
SE	------	------	------	------	------	------	------	------	------	------	------	------
SSE	------	------	------	------	------	------	------	------	------	------	------	------
S	------	------	------	------	------	------	------	------	------	------	------	------
SSW	------	------	------	------	.5	------	------	------	------	------	------	------
SW	.6	.6	0.2	------	------	------	------	------	------	------	------	------
WSW	.8	1.4	.4	------	1.5	1.0	0.5	------	1.2	3.6	------	------
W	2.6	1.8	.6	------	4.0	4.5	2.5	51	1.2	------	1.2	------
WNW	3.2	.6	.2	------	1.5	1.5	------	------	4.8	2.4	2.4	53
NW	1.8	.2	.2	61	1.0	.5	------	------	3.6	------	1.2	------
NNW	.4	------	------	------	1.0	.5	------	------	------	------	------	------
Total	9.8	4.6	1.6	------	10.5	8.0	3.0	------	10.8	6.0	4.8	------

SUMMER

N	0.1	------	------	------	0.2	------	------	------	0.9	0.3	------	------
NNE	------	------	------	------	------	------	------	------	.3	------	------	------
NE	------	------	------	------	------	------	------	------	.3	------	------	------
ENE	------	------	------	------	.2	------	------	------	.3	------	------	------
E	------	------	------	------	.2	------	------	------	------	------	------	------
ESE	------	------	------	------	------	------	------	------	------	------	------	------
SE	.1	------	------	------	------	------	------	------	------	------	------	------
SSE	------	------	------	------	------	------	------	------	------	------	------	------
S	------	------	------	------	------	------	------	------	------	------	------	------
SSW	------	------	------	------	.2	------	------	------	------	------	------	------
SW	------	------	------	------	------	------	------	------	.3	------	------	------
WSW	------	------	------	------	------	------	------	------	------	------	------	------
W	.2	------	------	------	.8	------	------	------	.3	------	------	------
WNW	.3	------	------	------	1.0	------	------	------	2.1	.3	------	------
NW	.1	.1	------	29	.4	0.2	------	28	1.2	.3	------	32
NNW	------	------	------	------	.4	------	------	------	.6	.3	------	------
Total	.8	.1	------	------	3.4	.2	------	------	6.3	1.2	------	------

AUTUMN

N	0.1	0.1	------	------	0.6	------	------	------	------	------	------	------
NNE	.1	------	------	------	------	------	------	------	------	------	------	------
NE	------	------	------	------	------	------	------	------	------	------	------	------
ENE	------	------	------	------	------	------	------	------	------	------	------	------
E	------	------	------	------	------	------	------	------	------	------	------	------
ESE	------	------	------	------	------	------	------	------	------	------	------	------
SE	------	------	------	------	------	------	------	------	------	------	------	------
SSE	------	------	------	------	------	------	------	------	------	------	------	------
S	------	------	------	------	------	------	------	------	------	------	------	------
SSW	------	.1	------	------	------	------	------	------	------	------	------	------
SW	------	.1	0.1	------	.3	------	0.3	------	------	------	------	------
WSW	.4	.4	.3	------	1.2	1.2	.3	50	------	1.0	1.5	40
W	.8	1.0	.3	------	3.3	.9	.9	------	1.0	3.0	------	------
WNW	1.4	.5	.4	47	3.0	.3	.3	------	2.5	1.0	1.5	------
NW	.7	.1	.2	------	.6	.3	------	------	1.5	2.0	------	------
NNW	.7	.2	------	------	------	.3	.3	------	1.5	1.0	------	------
Total	4.2	2.5	1.3	------	9.0	3.0	2.1	------	6.5	8.0	3.0	------

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

BROWNSVILLE, TEX.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	------	------	------	------	------	------	------	------	Insufficient data.			
NNE	------	------	------	------	------	------	------	------				
NE	------	------	------	------	------	------	------	------				
ENE	------	------	------	------	------	------	------	------				
E	------	------	------	------	------	------	------	------				
ESE	------	------	------	------	------	------	------	------				
SE	------	------	------	------	------	------	------	------				
SSE	------	------	------	------	------	------	------	------				
S	------	------	------	------	------	------	------	------				
SSW	------	------	------	------	------	------	------	------				
SW	------	------	0.7	38	------	------	------	------				
WSW	4.9	0.7	------	------	3.4	6.8	------	------				
W	2.1	2.1	------	------	------	6.8	------	------				
WNW	1.4	------	------	------	6.8	3.4	------	32				
NW	.7	.7	------	------	------	------	------	------				
NNW	------	------	------	------	------	------	------	------				
Total	9.1	3.5	.7	------	10.2	17.0	------	------				

SPRING

N	------	------	------	------	------	------	------	------	Insufficient data.			
NNE	------	------	------	------	------	------	------	------				
NE	------	------	------	------	------	------	------	------				
ENE	------	------	------	------	------	------	------	------				
E	------	------	------	------	------	------	------	------				
ESE	------	------	------	------	------	------	------	------				
SE	------	------	------	------	------	------	------	------				
SSE	------	------	------	------	------	------	------	------				
S	------	------	------	------	------	------	------	------				
SSW	------	------	------	------	------	------	------	------				
SW	------	------	------	------	------	------	------	------				
WSW	0.6	0.6	------	28	------	------	------	------				
W	2.4	------	------	------	7.8	2.6	------	30				
WNW	1.8	------	------	------	5.2	------	------	------				
NW	------	------	------	------	2.6	------	------	------				
NNW	------	------	------	------	------	------	------	------				
Total	4.8	.6	------	------	15.6	2.6	------	------				

SUMMER

N	------	------	------	21	------	------	------	------	------	------	------	------
NNE	------	------	------	------	------	------	------	------	------	------	------	------
NE	------	------	------	------	------	------	------	------	------	------	------	------
ENE	------	------	------	------	------	------	------	------	------	------	------	------
E	------	------	------	------	------	------	------	------	------	------	------	------
ESE	------	------	------	------	------	------	------	------	------	------	------	------
SE	------	------	------	------	------	------	------	------	------	------	------	------
SSE	------	------	------	------	------	------	------	------	------	------	------	------
S	------	------	------	------	------	------	------	------	------	------	------	------
SSW	------	------	------	------	------	------	------	------	------	------	------	------
SW	------	------	------	------	------	------	------	------	------	------	------	------
WSW	------	------	------	------	------	------	------	------	------	------	------	------
W	------	------	------	------	0.8	------	------	22	1.8	------	------	26
WNW	------	------	------	------	------	------	------	------	------	------	------	------
NW	------	------	------	------	------	------	------	------	------	------	------	------
NNW	------	------	------	------	------	------	------	------	------	------	------	------
Total	------	------	------	------	.8	------	------	------	1.8	------	------	------

AUTUMN

N	------	------	------	------	0.9	------	------	27	------	------	------	------
NNE	------	------	------	------	------	------	------	------	------	------	------	------
NE	------	------	------	------	------	------	------	------	------	------	------	------
ENE	------	------	------	------	------	------	------	------	------	------	------	------
E	------	------	------	------	------	------	------	------	------	------	------	------
ESE	------	------	------	------	------	------	------	------	------	------	------	------
SE	------	------	------	------	------	------	------	------	------	------	------	------
SSE	------	------	------	------	------	------	------	------	------	------	------	------
S	------	------	------	------	------	------	------	------	------	------	------	------
SSW	------	------	------	------	------	------	------	------	------	------	------	------
SW	------	------	------	------	------	------	------	------	------	------	------	------
WSW	0.3	------	------	23	1.8	------	------	------	------	------	------	------
W	------	------	------	------	.9	------	------	------	4.5	------	------	23
WNW	------	------	------	------	1.8	------	------	------	------	------	------	------
NW	------	------	------	------	------	------	------	------	------	------	------	------
NNW	------	------	------	------	------	------	------	------	------	------	------	------
Total	.3	------	------	------	5.4	------	------	------	4.5	------	------	------

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

BURLINGTON, VT.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S					Insufficient data				Insufficient data.			
SSW												
SW												
WSW	4.4											
W	6.6		2.2	41								
WNW	4.4											
NW		2.2										
NNW												
Total	15.4	2.2	2.2									

SPRING

N												
NNE												
NE												
ENE												
E												
ESE					2.2							
SE												
SSE												
S									Insufficient data.			
SSW												
SW		0.8			2.2							
WSW	1.6											
W	.8	.8										
WNW	.8	.8	0.8	41			2.2	38				
NW	4.0	.8										
NNW	1.6				2.2							
Total	8.8	3.2	.8		6.6		2.2					

SUMMER

N					1.6							
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	0.5											
SW		0.5			3.2							
WSW	1.0	1.5										
W	1.5	1.0			1.6							
WNW	1.0											
NW	2.0	1.0		33	1.6							
NNW	.5					1.6		30	4.8			27
Total	6.5	3.0			8.0	1.6			4.8			

AUTUMN

N												
NNE	0.9											
NE												
NNE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.9		0.9	40		1.8		30		8.2		35
WSW	.9								4.1			
W	1.8											
WNW	1.8				1.8							
NW	1.8				3.6				4.1			
NNW	.9				1.8							
Total	9.0		.9		7.2	1.8			8.2	8.2		

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

CHEYENNE, WYO.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	0.6											
NNE	.6				1.6							
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.3											
SW	.6	0.6										
WSW	2.1	.9										
W		.6			1.6							
WNW	1.5	.3										
NW	2.1	1.2	0.3	46	1.6			24				
NNW	.6	.6										18
Total	8.4	4.2	.3		4.8							

SPRING

N	0.4				1.1							
NNE	.4											
NE												
ENE												
E												
ESE												
SE												
SSE	.2											
S	.2											
SSW												
SW	.6											
WSW	.8	0.2										
W	1.6				2.2	1.1		29				
WNW	1.6	.4										
NW	.6	.4	0.4	42	1.1							29
NNW	.2											
Total	6.6	1.0	.4		4.4	1.1						

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S						0.7		36				
SSW												
SW	0.2	0.1										
WSW	.8				3.5					2.3	2.3	37
W	.5	.3							2.3			
WNW	1.1	.3		34	2.1				2.3			
NW	.3	.1										
NNW	.1											
Total	3.0	.8			5.6	.7			4.6	2.3	2.3	

AUTUMN

N	0.1					0.7						
NNE	.1											
NE	.1	0.1		36	0.7							
ENE					.7							
E	.1											
ESE												
SE												
SSE												
S												
SSW	.4											
SW	1.0	.1										
WSW	1.8	.2			.7							
W	1.1	.5			1.4	.7		31	4.4			
WNW	1.2	.2			.7	.7			4.4			
NW	.7				.7					2.2		31
NNW	.4	.2			1.4							
Total	7.0	1.3			6.3	2.1			8.8	2.2		

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

DUE WEST, S. C.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	1.0											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.5	0.5										
WSW	1.0	.5			2.0							
W	11.0	7.0	1.5		10.0	4.0	2.0	55	5.3			
WNW	8.5	4.5	2.5		6.0	14.0	2.0			10.6		
NW	2.0	2.0	1.0	61	8.0		2.0		10.6	5.3	5.3	47
NNW										5.3		
Total	24.0	14.5	5.0		26.0	18.0	6.0		15.9	21.2	5.3	

SPRING

N	0.2	0.2										
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW			0.2									
WSW	.2	.2	.2		1.4		1.4	48			2.0	39
W	1.6	1.2	.8		2.1	1.4			2.0			
WNW	1.2	1.0	.2	49	2.1	1.4			2.0	2.0		
NW	.6	.2			3.5	0.7				2.0		
NNW												
Total	3.8	2.8	1.4		9.1	3.5	1.4		4.0	4.0	2.0	

SUMMER

N	0.2											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.2											
SW						0.3		29				
WSW	.2								0.5			
W									1.5			27
WNW	.2											
NW									.5			
NNW		0.2		30								
Total	.8	.2				.3			2.5			

AUTUMN

N	0.2								0.6			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW			0.2									
SW		0.4										
WSW	1.0	.6			0.3	0.6			1.2	1.2	0.6	
W	4.4	.8			1.5	1.5	0.9	44	1.8			
WNW	3.0	1.2	.2		1.2	1.2	.3		4.8	.6	.6	80
NW	.8	.8	.6	48	.9				.6			
NNW					.3							
Total	9.4	3.8	1.0		4.2	3.3	1.2		9.0	1.8	1.2	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

ELLENDALE, N. DAK.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	0.4	0.4			1.4	1.4						
NNE	.4	.4			1.4							
NE	.4											
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW									3.8			
WSW	1.6											
W	2.0	1.2	0.4		1.4	2.8	1.4	37	3.8			
WNW	4.4	2.4	1.2	47	5.6	1.4				3.8		30
NW	2.4	3.2	1.2		2.8	1.4			7.6			
NNW	1.2	2.0	.4			1.4						
Total	12.8	9.6	3.2		12.6	8.4	1.4		15.2	3.8		

SPRING

N	0.8				2.1	0.7				1.6		
NNE	.2					1.4			1.6			
NE									1.6			
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.2											
SW	.2	0.6				1.4						
WSW	.6	.6	0.2		2.8	1.4			1.6	1.6		30
W	1.4	1.4	.2		2.1	1.4	0.7	37	3.2			
WNW	3.2	1.0			1.4	.7						
NW	3.0	2.4	.4	38	1.4	1.4			3.2			
NNW	1.4	.2	.2		2.8				3.2			
Total	11.0	6.2	1.0		12.6	8.4	.7		14.4	3.2		

SUMMER

N					0.3							
NNE									0.8			
NE					.3							
ENE												
E												
ESE												
SE												
SSE												
S												
SSW					.6				.8		0.8	
SW	0.1	0.1			.6				.8			
WSW	.4	.5		33	1.2	0.3			2.4	0.8	.8	
W	2.0	.2			1.8	2.4	0.6	40	2.4	.8	.8	40
WNW	2.1	.5			5.1	1.2			4.0	1.6		
NW	1.4	.2			3.0	.9			6.4	3.2	.8	
NNW	.2	.1			1.2	.6				1.6		
Total	6.2	1.6			14.1	5.4	.6		17.6	8.0	3.2	

AUTUMN

N	1.0				1.2					1.2		
NNE	.2									1.2		
NE	.2	0.2			.6							
ENE					1.2							
E												
ESE												
SE												
SSE												
S												
SSW	.4											
SW	.8				1.2				1.2	1.2		
WSW	1.6	.6	0.4		.6				1.2			
W	2.4	1.0	.4		3.6	1.2	1.2		2.4	3.6		35
WNW	2.8	1.4	.2		1.2	2.4			3.6	1.2		
NW	2.4	1.2	.6		3.6	1.8	.6	62	2.4			
NNW	1.4		.2	50	2.4	1.2			1.2			
Total	13.2	4.4	1.8		15.6	6.6	1.8		12.0	8.4		

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

EL PASO, TEX.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N		0.4										
NNE	0.4								3.2			
NE												
ENE						1.2						
E												
ESE												
SE												
SSE												
SSW												
SW	2.0	.4			1.2	2.4	1.2	38				
WSW	3.2	1.6			1.2	2.4					3.2	
W	4.4	2.4	1.2	39	4.8	1.2			6.4	3.2	3.2	40
WNW	2.0	.4			3.6	4.8				6.4		
NW	.4		.4		3.6							
NNW	.8	.4			1.2							
Total	13.2	5.6	1.6		15.6	12.0	1.2		9.6	9.6	6.4	

SPRING

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S	0.5											
SSW	.5											
SW	.5	1.5		35		1.2						
WSW	3.5				1.2	2.4	1.2	38				
W	4.5	1.5			4.8				6.2			
WNW	.5									6.2		30
NW	.5								3.1			
NNW												
Total	10.5	3.0			6.0	3.6	1.2		9.3	6.2		

SUMMER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.4	0.4		28								
WSW					2.0			23				
W									2.3			23
WNW												
NW												
NNW												
Total	.4	.4			2.0				2.3			

AUTUMN

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.8	0.4	0.4	39	0.7							
WSW	2.0				1.4	0.7			5.1			
W	.8				.7	.7	0.7	46	3.4			
WNW	.8	.8				1.4			3.4	1.7		
NW	.8				.7	1.4			5.1		1.7	50
NNW	.8				.7							
Total	6.0	1.2	.4		4.2	4.2	.7		17.0	1.7	1.7	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

EVANSVILLE, IND.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N					Insufficient data.				Insufficient data.			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W	11.2		5.6	38								
WNW		5.6										
NW	5.6											
NNW	5.6											
Total	22.4	5.6	5.6									

SPRING

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	0.8											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W	1.6	0.8			1.6							
WNW		.8		32								
NW	.8								3.2			22
NNW					1.6			24				
Total	3.2	1.6			3.2				3.2			

SUMMER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE					1.0							
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W												
WNW	0.4				1.0			26				18
NW	.4				2.0							
NNW	.4			25	1.0							
Total	1.2				5.0							

AUTUMN

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW					2.6	2.6		28				
W												
WNW	2.0			27								
NW	2.0											18
NNW												
Total	4.0				2.6	2.6						

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

GREENSBORO, N. C.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S					Insufficient data				Insufficient data.			
SSW												
SW												
WSW	3.0		3.0									
W	6.0	13.5	1.5									
WNW	7.5	3.0	3.0	44								
NW												
NNW												
Total	16.5	16.5	7.5									

SPRING

N									1.8			
NNE							0.9	38				
NE												
ENE									1.8			
E												
ESE												
SE												
SSE												
S									1.8			
SSW					0.9							
SW		0.4										
WSW	0.4	.4	0.4	49	1.8							
W	2.4	1.2			2.7	2.7			1.8			
WNW	2.0		.4		3.6	.9			1.8	3.6		35
NW	2.0	.4			.9				1.8	1.8		
NNW					.9							
Total	6.8	2.4	.8		10.8	3.6	.9		10.8	5.4		

SUMMER

N	0.2											
NNE												
NE	.2								0.7			
ENE									.7	0.7		
E												
ESE												
SE												
SSE												
S												
SSW		0.2		28								
SW	.2				0.4				.7	.7		
WSW					1.2				1.4	.7		
W					.4	0.4		28	.7			
WNW	.2											
NW	.2								1.4			
NNW	.4								.7	1.4		34
Total	1.4	.2			2.0	.4			6.3	3.5		

AUTUMN

N	0.3											
NNE		0.3										
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.3				0.8					1.7	1.7	41
WSW		.3			.8				1.7		1.7	
W	.6		0.3	41	4.8	0.8				1.7		
WNW	.6	.3			1.6				3.4			
NW	.6	.9			.8							
NNW	.3				.8	.8		33				
Total	2.7	1.8	.3		9.6	1.6			5.1	3.4	3.4	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

GROESBECK, TEX.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	0.6				0.8							
NNE	.3	0.3			.8	0.8					1.7	
NE					1.6				1.7			
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.3		0.3						1.7			
WSW	2.4	3.0			4.8	1.6	0.8		5.1			
W	3.9	4.5	1.8		8.0	1.6	1.6	60	3.4	1.7		
WNW	3.9	3.9	.3	45	5.6	1.6	1.6		6.8	3.4	3.4	54
NW	2.4	.9	.3		4.0	2.4			1.7	3.4	1.7	
NNW	1.2				.8				1.7	1.7		
Total	15.0	11.7	2.7		26.4	8.0	4.0		22.1	10.2	6.8	

SPRING

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW		0.2			0.5							
WSW	2.0	1.0			1.0	1.0			1.1	1.1	1.1	44
W	3.4	2.2			5.0	4.0	2.0	51	6.6	2.2		
WNW	4.8	1.0	0.2	41	5.5	4.0	1.0		2.2	4.4	1.1	
NW	1.2	.4			2.5	1.0	.5		3.3	2.2		
NNW	.2								1.1			
Total	11.6	4.8	.2		14.5	10.0	3.5		14.3	9.9	2.2	

SUMMER

N									0.2			
NNE									.2			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW										0.2		
W					0.2			25	.2			
WNW									.6			
NW	0.1			23	.2					.2		36
NNW												
Total	.1				.4				1.2	.4		

AUTUMN

N					0.6				0.8			
NNE									.4			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW										0.4		
SW	0.4					0.3				.4		
WSW	1.4	0.2			.3	.3						
W	1.4	1.2			1.8	2.1	0.3	37	2.4	2.4	0.8	45
WNW	2.0	.8		35	3.3	1.2			3.2	1.2		
NW	.6	.4			1.5	.6			1.6	.8		
NNW	.4	.2			.6				1.2	.4		
Total	6.2	2.8			8.1	4.5	.3		9.6	5.6	.8	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

HAVRE, MONT.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE		1.0			2.4							
NE	1.0											
ENE												
E												
ESE												
SE												
SSE												
S					2.4							
SSW												
SW	1.0											
WSW												
W						2.4		32	6.3			
WNW	5.0	1.0		32								
NW	1.0	1.0							12.6			25
NNW	2.0	1.0			2.4							
Total	10.0	4.0			7.2	2.4			18.9			

SPRING

N	0.4											
NNE	.4											
NE	.8								2.6			
ENE	.4											
E												
ESE												
SE												
SSE												
S	.4											
SSW												
SW	.8	0.4										
WSW	2.0											
W	1.6	.4			1.1	1.1	1.1	37	2.6	2.6	2.6	41
WNW	1.6	1.2			2.2							
NW	1.6	.4	0.4	39	3.3							
NNW	.8	1.2										
Total	10.8	3.6	.4		6.6	1.1	1.1		5.2	2.6	2.6	

SUMMER

N									3.0			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S										1.5		
SSW		0.4										
SW	0.8	.4	0.2	47	0.6					1.5		35
WSW	4.2	1.2	.2		4.8	0.6			4.5	1.5		
W	4.6	.6			4.8	1.2		31	1.5			
WNW	1.6	.2			1.2							
NW	.2				1.2				1.5	1.5		
NNW					.6							
Total	11.4	2.8	.4		13.2	1.8			10.5	6.0		

AUTUMN

N	0.5	0.5							2.4	2.4		35
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW							1.4	38				
WSW	2.0											
W	2.0	1.0										
WNW	2.5	2.5			1.4	4.2			4.8			
NW	3.0	2.5		38	1.4	1.4						
NNW	1.0	2.5				1.4						
Total	11.0	9.0			2.8	7.0	1.4		7.2	2.4		

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

JACKSONVILLE, FLA.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N									Insufficient data			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	3.3	1.1			3.4							
W	7.7	3.3		33	3.4	3.4						
WNW	4.4	2.2			6.8	6.8		29				
NW	1.1				3.4							
NNW												
Total	16.5	6.6			17.0	10.2						

SPRING

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.3											
WSW	.3				0.6		0.6	47				
W	3.9	1.2			1.8	1.2				1.6		31
WNW	1.5	.9		35	1.8	1.2	.6		3.2			
NW	.3	.3			.6				1.6	1.6		
NNW												
Total	6.3	2.4			4.8	2.4	1.2		4.8	3.2		

SUMMER

N												
NNE					0.3				0.5			
NE												
ENE									.5			
E												
ESE									.5			
SE												
SSE												
S												
SSW												
SW									.5			
WSW									.5			
W					.3	0.3		28	.5	0.5		30
WNW	0.2			22								
NW												
NNW												
Total	.2				.6	.3			3.0	.5		

AUTUMN

N									1.8			
NNE												
NE									1.8			
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.4									1.8		
WSW	.8								3.6	1.8	1.8	37
W	.8				3.6	2.7		35	7.2	1.8		
WNW	.8				1.8				5.4	1.8		
NW	.8	0.4		32	.9	.9						
NNW									1.8			
Total	3.6	.4			6.3	3.6			21.6	7.2	1.8	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

KEY WEST, FLA.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N									1.1	1.1		
NNE												
NE												
ENE												
E												
ESE												
SE	0.2											
SSE												
S												
SSW	.2											
SW	.2				0.4					1.1		
WSW	.4	0.4		30	1.2	0.4			1.1	1.1		
W	.4				2.8	3.6			11.0	1.1	2.2	38
WNW	.8				.8	1.2	0.4	43	2.2	1.1		
NW	.2	.2			.4				1.1			
NNW												
Total	2.4	.6			5.6	5.2	.4		16.5	5.5	2.2	

SPRING

N	0.2											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.4					0.4			1.5			
W	1.2	0.2		31	4.4	.4	0.8	42	12.0	1.5		
WNW	1.0				2.4	1.2			3.0	3.0		31
NW	.2				1.2				3.0			
NNW	.2				.4				1.5			
Total	3.2	.2			8.4	2.0	.8		21.0	4.5		

SUMMER

N												
NNE												
NE												
ENE												
E				18								
ESE												
SE												
SSE												
S												
SSW												
SW										1.0	0.5	38
WSW												
W					0.2			26				
WNW												
NW												
NNW												
Total					.2					1.0	.5	

AUTUMN

N									0.7			
NNE												
NE												
ENE												
E					0.3							
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW						0.3			.7			
W	0.2			24					4.9			27
WNW					.6	.3		34	2.1			
NW					.3							
NNW												
Total	.2				1.2	.6			8.4			

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

LANSING, MICH.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	2.5	2.5			Insufficient data				Insufficient data.			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.5	2.5	2.5									
W	2.5	2.5	2.5									
WNW	5.0	2.5										
NW			2.5	81								
NNW	2.5											
Total	15.0	10.0	7.5									

SPRING

N	0.9											
NNE					1.8							
NE												
ENE					1.8							
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.9											
WSW	1.8									3.3		28
W	3.6				5.4				3.3			
WNW	1.8	0.9	0.9	50	1.8	1.8			3.3			
NW	4.5						1.8	37	6.6			
NNW	.9				1.8				6.6			
Total	14.4	.9	.9		12.6	1.8	1.8		19.8	3.3		

SUMMER

N									2.1			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW					1.8				2.1			
WSW									2.1			
W	1.5				3.6					2.1		31
WNW	1.0				3.6				2.1			
NW	1.5			25	.9					2.1		
NNW					1.8	0.9		29				
Total	4.0				11.7	.9			8.4	4.2		

AUTUMN

N	0.9											
NNE					1.6							
NE		0.9								2.6		
ENE					1.6							
E												
ESE												
SE												
SSE												
S												
SSW												
SW									2.6			
WSW	2.7				1.6							
W	1.8	2.7			1.6	1.6			2.6			
WNW	2.7	1.8	0.9	39					5.2		2.6	40
NW	.9	.9				4.8		34	2.6	5.2		
NNW					1.6							
Total	9.0	6.3	.9		8.0	6.4			13.0	7.8	2.6	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

LOS ANGELES, CALIF.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N									4.0	4.0		
NNE												
NE	0.7	1.4			2.0							
ENE												
E	.7											
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.7								4.0			
W	2.8								4.0			
WNW	1.4				2.0							
NW	1.4	.7		32	2.0					4.0		32
NNW	.7				2.0	2.0		28				
Total	8.4	2.1			8.0	2.0			12.0	8.0		

SPRING

N	1.8											
NNE	.6											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.6				1.6				3.8	3.8		30
W	2.4	0.6		33	1.6							
WNW	1.2				1.6							
NW												
NNW	.6				3.2			26				
Total	7.2	.6			8.0				3.8	3.8		

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW									2.2			
SW	9.5			23		1.0		30				
WSW									4.4			24
W												
WNW												
NW												
NNW												
Total	9.5					1.0			6.6			

AUTUMN

N	0.5											
NNE												
NE	.5											
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.5											
SW									2.3	2.3		28
WSW	.5						1.0	49	2.3			
W	.5	0.5		31	1.0							
WNW	1.0				1.0							
NW	.5				1.0							
NNW												
Total	4.0	.5			3.0		1.0		4.6	2.3		

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

MADISON, WIS.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	6.6								Insufficient data.			
NNE												
NE						6.3						
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.2											
W	2.2				6.3							
WNW	2.2		2.2	49	6.3	18.9		34				
NW	4.4	4.4	2.2			6.3						
NNW	2.2		2.2		6.3							
Total	19.8	4.4	6.6		18.9	31.5						

SPRING

N	1.1								Insufficient data.			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	1.1					2.8						
W	5.5					5.6						
WNW		1.1	1.1	38	2.8							
NW	1.1	3.3			2.8		2.8	46				
NNW					2.8							
Total	8.8	4.4	1.1		8.4	8.4	2.8					

SUMMER

N					1.0	1.0		29	2.3			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	0.5								2.3			
W	1.0	0.5		32								
WNW	2.0				3.0				2.3			
NW	1.5	1.0			4.0	1.0				2.3		28
NNW	1.0								2.3			
Total	6.0	1.5			8.0	2.0			9.2	2.3		

AUTUMN

N					3.2				4.2			
NNE					3.2							
NE	0.9											
ENE												
E					1.6							
ESE												
SE												
SSE												
S	.9											
SSW												
SW	1.8				1.6							
WSW	.9				3.2							
W	1.8				4.8				8.4			25
WNW	3.6	1.8			6.4	1.6						
NW	2.7	.9	0.9	47	1.6	1.6	1.6	58				
NNW	.9	.9			3.2		1.6					
Total	13.5	3.6	.9		28.8	3.2	3.2		12.6			

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

MEMPHIS, TENN.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N					Insufficient data.				Insufficient data.			
NNE												
NE												
ENE												
E												
ESE												
SE												
S												
SSW												
SW	3.0	3.0										
WSW			3.0	38								
W	6.0	3.0										
WNW	6.0											
NW												
NNW												
Total	15.0	6.0	3.0									

SPRING

N									Insufficient data.			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.0			27								
W	2.0											
WNW	1.0							20				
NW	1.0											
NNW												
Total	6.0											

SUMMER

N												
NNE								20				
NE									1.8			25
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W	0.6	0.3		33								
WNW	.3	.3										
NW												
NNW												
Total	.9	.6							1.8			

AUTUMN

N												
NNE												
NE									3.4			22
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W	0.9											
WNW	.9			27	1.6							
NW												
NNW					1.6			26				
Total	1.8				3.2				3.4			

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

MODENA, UTAH

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	1.4	0.4			0.8		0.8	40	2.2			
NNE	1.0	.2			1.6	1.6				4.4		31
NE					1.6							
ENE												
E												
ESE												
SE												
SSE									2.2			
S												
SSW												
SW												
WSW	.4											
W	1.2	.6			.8	.8				2.2		
WNW	1.0	1.0			1.6							
NW	1.0	1.0	0.4	58	2.4	.8	.8					
NNW	1.4	.4	.2		2.4	3.2			6.6			
Total	7.4	3.6	.6		11.2	6.4	1.6		11.0	6.6		

SPRING

N	0.2	0.8								2.9		
NNE			0.2		0.8							
NE									2.9			
ENE												
E												
ESE												
SE		.2										
SSE		.2										
S		.2										
SSW	.4				.8	.8						
SW	1.0	.2										
WSW	1.2				1.6					2.9		
W	.6	.6			1.6							
WNW	1.4	.6			4.8						2.9	37
NW	2.2	1.0	.2	43	1.6	.8		30				
NNW	1.0	.4	.2		3.2				2.9			
Total	8.0	4.2	.6		14.4	1.6			5.8	5.8	2.9	

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S	0.2											
SSW	.6	0.2			1.8							
SW	.8	.4		31	1.8	0.6		30	3.3			
WSW	.8	.2			1.2	.6			6.6			
W	1.0				1.8					6.6		36
WNW					.6							
NW	.4											
NNW												
Total	3.8	.8			7.2	1.2			9.9	6.6		

AUTUMN

N	0.2	0.3	0.1		1.0							
NNE	.5	.1	.1		.5	0.5				1.3		
NE		.2			1.0	.5		36	1.3			
ENE	.1									1.3		
E												
ESE												
SE												
SSE												
S												
SSW	.1	.2								1.3		
SW	.5	.3			2.5	1.5						
WSW	.6	.1			3.0	1.5			3.9	1.3	2.6	
W	.5	.3			2.0					2.6	1.3	48
WNW	.5	.1			1.0	.5			1.3	1.3		
NW	.5	.4			2.0	1.0			2.6	2.6		
NNW	.3		.1	40		.5						
Total	3.8	2.0	.3		13.0	6.0			9.1	11.7	3.9	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

NEW ORLEANS, LA.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N									Insufficient data.			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW		1.5										
WSW	4.5											
W	4.5	1.5		32	4.4	8.8		34				
WNW	3.0	1.5			4.4							
NW		1.5										
NNW												
Total	12.0	6.0			8.8	8.8						

SPRING

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW									2.9			
WSW	1.0	1.0			1.2	1.2						
W	3.5	.5			6.0	1.2			5.8		2.9	43
WNW	2.5	1.0	0.5	40	4.8	3.6		33	8.7			
NW	.5				1.2					2.9		
NNW												
Total	7.5	2.5	.5		13.2	6.0			17.4	2.9	2.9	

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW								20				
W									1.9	1.9		31
WNW				18								
NW												
NNW									1.9			
Total									3.8	1.9		

AUTUMN

N												
NNE									1.8			
NE												
ENE									1.8			
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.5											
WSW	1.0				1.6					3.6	1.8	37
W	2.0	1.5		32	2.4				5.4	5.4		
WNW	1.5				3.2			27	3.6			
NW									1.8	1.8		
NNW									1.8			
Total	5.0	1.5			7.2				16.2	10.8	1.8	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

OMAHA, NEBR.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE	0.6					1.7		28				
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.4	0.6	1.2									
W	.6	1.2	.6	47						3.4		28
WNW	3.0	.6										
NW	.6	1.8			1.7							
NNW	2.4											
Total	9.6	4.2	1.8		1.7	1.7				3.4		

SPRING

N	0.9					0.9						
NNE						.9						
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW										2.2		33
WSW					0.9				2.2	2.2		
W	1.8	0.3			.9		0.9	38	4.4			
WNW	.6				5.4				2.2			
NW	2.1				.9				4.4			
NNW	.3	.3		31	.9	.9			2.2			
Total	5.7	.6			9.0	2.7	.9		15.4	4.4		

SUMMER

N	0.2								1.2			
NNE									.6			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW									.6			
WSW	.2									0.6		
W	.2				1.2	0.6			.6	1.2		
WNW	.7				2.1	.3		31	1.8			
NW		0.1		28	.9	.3			2.4			
NNW	.1				1.8	.3			.6	1.2		33
Total	1.4	.1			6.0	1.5			7.8	3.0		

AUTUMN

N	0.6	0.2										
NNE		.4							1.2			
NE		.2										
ENE												
E												
ESE												
SE												
SSE												
S												
SSW		.2										
SW	.4				0.6				1.2			
WSW	1.0	.2			.6	0.6	0.6	38	3.6			
W	1.2	.2	0.2		.6		.6				1.2	36
WNW	1.8		.2	39	1.2	.6			1.2			
NW	1.8	.2				.6			1.2			
NNW	.2	.2			.6				1.2			
Total	7.0	1.8	.4		3.6	1.8	1.2		9.6		1.2	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

PORTLAND, OREG.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	1.8	0.9	.....	.....	.....	5.2	.....	.....	4.1	4.1	.....	35
NNE	.....	2.7	0.9	48	.....	2.6	.....	.....	.....	.....	.....	.....
NE	.9	.....	.....	.....	.....	.....	2.6	39	.....	.....	.....	.....
ENE	.....	.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.....	.....	.....	.....	2.6	.....	.....	.....	.....	4.1	.....	.....
WSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
W	.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
WNW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NW	.....	.....	.9	.....	.....	.....	.....	.....	4.1	.....	.....	.....
NNW	.....	.....	.....	.....	2.6	.....	.....	.....	4.1	.....	.....	.....
Total	3.6	4.5	1.8	.....	5.2	7.8	2.6	.....	12.3	8.2	.....	.....

SPRING

N	0.5	.....	.....	.....	.....	.....	.....	.....	2.1	.....	.....	.....
NNE	.....	.....	.....	.....	1.3	.....	.....	.....	.....	.....	.....	.....
NE	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.1	.....	.....
ENE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	2.1	.....	.....	.....
SSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
WSW	.....	.....	.....	.....	1.3	1.3	.....	.....	.....	.....	.....	.....
W	1.5	.....	.....	.....	5.2	.....	1.3	38	2.1	2.1	.....	.....
WNW	.5	.....	.....	.....	.....	.....	.....	.....	2.1	2.1	.....	33
NW	2.0	0.5	.....	.....	2.6	.....	.....	.....	.....	.....	.....	.....
NNW	.....	.5	.....	31	.....	.....	.....	.....	.....	.....	.....	.....
Total	4.5	1.0	.....	.....	10.4	1.3	1.3	.....	8.4	6.3	.....	.....

SUMMER

N	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NNE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ENE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	0.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	1.0	0.2	.....	.....	0.6	.....	.....	.....	2.2	.....	.....	.....
SW	2.6	.8	.....	.....	2.4	.....	.....	.....	1.1	1.1	.....	.....
WSW	1.4	.2	.....	.....	4.2	0.6	.....	.....	3.3	3.3	.....	31
W	.6	.8	.....	.....	1.8	.....	0.6	37	3.3	1.1	.....	.....
WNW	.4	.....	.....	.....	.....	.6	.....	.....	2.2	.....	.....	.....
NW	.2	.....	.....	.....	.....	.6	.....	.....	.....	.....	.....	.....
NNW	.....	.....	0.2	39	.6	.....	.....	.....	1.1	.....	.....	.....
Total	6.4	2.0	.2	.....	9.6	1.8	.6	.....	13.2	5.5	.....	.....

AUTUMN

N	0.6	.....	.....	.....	.....	1.3	.....	.....	.....	.....	.....	.....
NNE	1.2	1.2	.....	.....	2.6	.....	.....	.....	.....	.....	.....	.....
NE	.....	.....	.....	.....	1.3	.....	.....	.....	.....	.....	.....	.....
ENE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
WSW	3.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
W	.6	.....	.....	.....	1.3	1.3	.....	32	.....	.....	.....	.....
WNW	1.2	.6	.....	33	3.9	.....	.....	.....	.....	.....	.....	.....
NW	.6	.....	.....	.....	1.3	.....	.....	.....	2.4	.....	.....	27
NNW	.....	.....	.....	.....	.....	.....	.....	.....	2.4	.....	.....	.....
Total	7.8	1.8	.....	.....	10.4	2.6	.....	.....	4.8	.....	.....	.....

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

REDDING, CALIF.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	0.6	1.2	.....	.....	.....	2.0	.....	.....	.....	.....	.....	.....
NNE	.8	.2	.....	.....	.....	3.0	1.0	.....	.....	.....	.....	.....
NE	.2	.2	0.2	48	1.0	.....	.....	.....	.....	2.0	.....	.....
ENE	.4	.2	.....	.....	.....	.....	.....	.....	2.0	.....	.....	.....
E	.2	.....	.....	.....	1.0	1.0	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.0	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.4	.....	.....	.....	.....	1.0	.....	.....	.....	2.0	.....	.....
SW	.2	.....	.....	.....	.....	1.0	.....	.....	.....	.....	.....	.....
WSW	.6	.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
W	.8	.2	.....	.....	.....	.....	1.0	.....	2.0	.....	.....	.....
WNW	1.0	.6	.....	.....	2.0	.....	.....	.....	2.0	.....	.....	.....
NW	3.4	1.4	1.2	.....	2.0	2.0	3.0	.....	4.0	4.0	2.0	58
NNW	2.0	1.4	.6	.....	1.0	1.0	3.0	48	.....	.....	4.0	.....
Total	10.8	6.0	2.0	.....	7.0	11.0	8.0	.....	10.0	10.0	6.0	.....

SPRING

N	0.6	0.6	0.4	45	2.1	1.4	.....	.....	3.0	.....	1.5	39
NNE	.....	.2	.....	.....	.7	.....	.....	.....	.....	.....	.....	.....
NE	.2	.....	.....	.....	.7	.....	.....	.....	.....	.....	.....	.....
ENE	.2	.....	.....	.....	.....	.....	.....	.....	.....	1.5	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	1.5	.....	.....	.....
S	.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.6	.4	.....	.....	.....	.....	.....	.....	1.5	.....	.....	.....
SW	1.0	.2	.....	.....	2.8	.....	.....	.....	.....	.....	.....	.....
WSW	.6	.....	.....	.....	1.4	.....	.....	.....	.....	.....	.....	.....
W	1.8	.....	.....	.....	2.1	.....	.....	.....	.....	.....	.....	.....
WNW	1.8	.8	.6	.....	2.1	2.1	1.4	.....	.....	6.0	1.5	.....
NW	3.0	.4	.....	.....	2.1	.7	.7	60	3.0	.....	.....	.....
NNW	2.0	.8	.....	.....	2.1	.....	.7	.....	1.5	1.5	.....	.....
Total	12.2	3.4	1.0	.....	16.1	4.2	2.8	.....	10.5	9.0	3.0	.....

SUMMER

N	.....	.....	.....	.....	.....	.....	0.4	37	.....	0.8	.....	.....
NNE	0.2	0.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NE	.2	.....	.....	.....	.....	0.4	.....	.....	.....	.....	0.8	40
ENE	.....	.....	.....	.....	0.4	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.2	.....	.....	.4	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.8	.2	.....	.....	.8	.4	.....	.....	0.8	.....	.....	.....
SW	3.0	.6	.....	.....	.4	2.0	.....	.....	4.8	2.4	.....	.....
WSW	1.4	.....	.....	.....	4.8	1.6	.....	.....	7.2	1.6	.....	.....
W	1.0	.2	.....	.....	1.6	.....	.....	.....	1.6	1.6	.....	.....
WNW	.4	.2	.2	.....	.8	.....	.....	.....	2.4	.....	.....	.....
NW	.4	.4	.2	37	.....	.....	.....	.....	1.6	.....	.....	.....
NNW	.2	.2	.....	.....	.4	.....	.....	.....	.....	.....	.....	.....
Total	7.8	2.0	.4	.....	9.6	4.4	.4	.....	18.4	6.4	.8	.....

AUTUMN

N	1.0	0.4	.....	.....	1.0	0.5	.....	.....	0.8	.....	.....	.....
NNE	.8	.....	.....	.....	.5	.5	.....	.....	1.6	1.6	.....	.....
NE	.2	.....	.....	.....	.....	.5	.....	.....	.....	.....	.....	.....
ENE	.2	.....	.....	.....	.5	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.5	.....	.....	.8	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	1.6	.....	.....	.....
SSW	.6	.....	.....	.....	.....	.....	.....	.....	1.6	.....	.....	.....
SW	.4	.2	.....	.....	1.5	.....	.....	.....	.....	.....	.....	.....
WSW	.6	.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
W	1.6	.2	.....	.....	1.5	.....	0.5	.....	.8	.8	.....	.....
WNW	1.0	1.0	.....	.....	.....	1.0	.....	.....	.8	.....	.....	.....
NW	1.6	1.0	.6	48	2.0	.....	.5	43	.....	.....	0.8	37
NNW	.2	.8	.2	.....	.5	.5	.....	.....	.....	.8	.....	.....
Total	8.2	3.8	.8	.....	7.5	3.5	1.0	.....	8.0	3.2	.8	.....

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

ROYAL CENTER, IND.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	.....	.....	.....	.....	.....	.....	.....	.....	Insufficient data.			
NNE	.....	.....	.....	.....	.....	.....	.....	.....				
NE	.....	.....	.....	.....	.....	.....	.....	.....				
ENE	.....	.....	.....	.....	.....	.....	.....	.....				
E	.....	.....	.....	.....	.....	.....	.....	.....				
ESE	.....	.....	.....	.....	.....	.....	.....	.....				
SE	.....	.....	.....	.....	.....	.....	.....	.....				
SSE	.....	.....	.....	.....	.....	.....	.....	.....				
S	.....	.....	.....	.....	.....	.....	.....	.....				
SSW	.....	.....	.....	.....	.....	.....	.....	.....				
SW	.....	.....	.....	.....	.....	.....	.....	.....				
WSW	1.4	1.4	.....	.....	4.6	.....	.....	.....				
W	4.2	2.8	1.4	.....	9.2	4.6	.....	.....				
WNW	5.6	7.0	.....	.....	9.2	.....	4.6	48				
NW	7.0	1.4	1.4	40	4.6	.....	.....	.....				
NNW	2.8	1.4	.....	.....	4.6	4.6	.....	.....				
Total	21.0	14.0	2.8	.....	32.2	9.2	4.6	.....				

SPRING

N	.....	0.4	.....	.....	.....	.....	.....	.....	2.3	.....	.....	.....
NNE	0.4	.....	.....	.....	0.9	0.9	.....	.....	.....	.....	.....	.....
NE	.....	.....	.....	.....	.9	.....	.....	.....	.....	.....	.....	.....
ENE	.4	.4	.....	.....	.....	.9	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.4	.....	.4	39	.9	.9	2.7	42	2.3	.....	.....	.....
WSW	.8	.4	.....	.....	.9	.9	.....	.....	2.3	.....	.....	.....
W	2.0	.....	.....	.....	.9	.....	.....	.....	2.3	.....	.....	.....
WNW	2.8	.8	.....	.....	1.8	.....	.....	.....	2.3	2.3	2.3	44
NW	2.4	.8	.....	.....	1.8	.9	.....	.....	2.3	.....	.....	.....
NNW	.8	.....	.....	.....	.9	.....	.....	.....	2.3	.....	.....	.....
Total	10.0	2.8	.4	.....	9.0	4.5	2.7	.....	16.1	2.3	2.3	.....

SUMMER

N	0.2	.....	.....	.....	.....	0.8	.....	.....	0.9	0.9	.....	.....
NNE	.....	.....	.....	.....	1.2	.....	.....	.....	2.7	.....	.....	.....
NE	.....	.....	.....	.....	.....	.....	.....	.....	.9	.9	.....	.....
ENE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.9	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.....	.....	.....	.....	.4	.....	.....	.....	1.8	.9	.....	.....
WSW	.....	0.2	.....	.....	.4	.....	.....	.....	.....	.....	.....	.....
W	1.2	.....	.....	.....	1.2	.4	.....	.....	1.8	.....	.....	.....
WNW	1.2	.2	.....	.....	1.2	.4	.....	.....	.....	1.8	.....	.....
NW	1.2	.4	.....	30	.8	.4	.....	31	1.8	.9	.....	34
NNW	1.2	.....	.....	.....	1.6	.....	.....	.....	.....	.9	.....	.....
Total	5.0	.8	.....	.....	6.8	2.0	.....	.....	10.8	6.3	.....	.....

AUTUMN

N	0.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NNE	.3	0.3	.....	.....	.....	.....	.....	.....	1.4	.....	.....	.....
NE	.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ENE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	0.6	.....	.....	.....	.....	.....	.....	.....
SSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
WSW	2.1	.3	.3	.....	1.8	0.6	.....	.....	1.4	.....	.....	.....
W	3.9	1.5	.3	53	1.2	1.2	1.2	48	4.2	.....	.....	.....
WNW	2.1	.9	.....	.....	2.4	.6	.....	.....	4.2	1.4	.....	.....
NW	.9	.6	.....	.....	3.0	.....	.6	.....	2.8	.....	1.4	.....
NNW	.9	.....	.....	.....	1.2	.6	.....	.....	1.4	1.4	1.4	39
Total	11.1	3.6	.6	.....	10.2	3.0	1.8	.....	15.4	2.8	2.8	.....

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

SAN FRANCISCO, CALIF.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	.....	1.0	.....	.....	.....	.....	.....	.....	.....	3.4	.....	.....
NNE	.....	.....	.....	.....	1.6	.....	.....	.....	.....	.....	.....	.....
NE	0.5	.....	.....	.....	1.6	.....	.....	.....	.....	.....	.....	.....
ENE	.....	.5	.....	33	.....	.....	.....	.....	3.4	.....	.....	.....
E	.....	.....	.....	.....	1.6	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
WSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
W	.5	.....	.....	.....	.....	.....	.....	.....	3.4	.....	.....	.....
WNW	1.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NW	2.0	.....	.....	.....	.....	.....	.....	.....	3.4	.....	.....	.....
NNW	1.5	.5	.....	.....	1.6	.....	1.6	46	3.4	3.4	.....	30
Total	6.0	2.0	.....	.....	6.4	.....	1.6	.....	13.6	6.8	.....	.....

SPRING

N	0.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NNE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ENE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	1.4	.....	.....	22	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.....	0.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
WSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
W	1.2	.....	.....	.....	.....	.....	.....	.....	2.4	.....	.....	22
WNW	.....	.4	.....	29	.....	.....	.....	.....	.....	.....	.....	.....
NW	.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NNW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	2.0	.8	.....	.....	1.4	.....	.....	.....	2.4	.....	.....	.....

SUMMER

N	0.4	.....	.....	25	.....	.....	.....	.....	.....	.....	.....	.....
NNE	.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ENE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.....	.....	.....	.....	0.6	.....	.....	.....	1.1	.....	.....	.....
SW	.....	.....	.....	.....	.....	0.6	.....	28	3.3	3.3	.....	.....
WSW	.....	.....	.....	.....	1.8	.....	.....	.....	2.2	1.1	.....	30
W	.....	.....	.....	.....	1.2	.....	.....	.....	3.3	.....	.....	.....
WNW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
NW	.....	.....	.....	.....	.6	.....	.....	.....	.....	.....	.....	.....
NNW	.....	.....	.....	.....	.6	.....	.....	.....	.....	.....	.....	.....
Total	.6	.....	.....	.....	4.8	.6	.....	.....	9.9	4.4	.....	.....

AUTUMN

N	0.3	0.3	0.3	.....	.....	.....	.....	.....	.....	.....	.....	.....
NNE	.3	.....	.....	.....	1.5	.....	.....	.....	1.0	.....	.....	.....
NE	.3	.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ENE	.....	.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.5	.....	.....	.....	.....	.....	.....	.....
ESE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
S	.....	.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SSW	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
SW	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.0	.....	34
WSW	.3	.....	.....	.....	1.0	.....	.....	.....	.....	.....	.....	.....
W	.....	.....	.....	.....	.5	0.5	.....	29	1.0	.....	.....	.....
WNW	.3	.3	.....	.....	.5	.....	.....	.....	2.0	1.0	.....	.....
NW	.....	.....	.3	47	.5	.....	.....	.....	.....	1.0	.....	.....
NNW	.....	.3	.....	.....	.5	.....	.....	.....	1.0	.....	.....	.....
Total	1.5	2.1	.6	.....	5.0	.5	.....	.....	5.0	3.0	.....	.....

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

SAULT STE. MARIE, MICH.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N					Insufficient data.				Insufficient data.			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW		3.1										
W	3.1											
WNW	3.1											
NW		3.1										
NNW	3.1	3.1		31								
Total	9.3	9.3										

SPRING

N	1.2											
NNE												
NE		0.4			1.1							
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.8					1.1						
W	1.2	.4	0.4	49	2.2	2.2			4.8	2.4		
WNW	1.6	.8	.4		3.3	5.5				2.4		35
NW	2.4	.8	.4		1.1	2.2	1.1	38	2.4	2.4		
NNW	3.2	.8			3.3				2.4			
Total	10.4	3.2	1.2		11.0	11.0	1.1		9.6	7.2		

SUMMER

N	0.9	0.3			0.6	0.6			2.8	2.8		
NNE	.3								1.4		1.4	48
NE										1.4		
ENE												
E												
ESE												
SE												
SSE												
S												
SSW										1.4		
SW	.3				1.8		0.6	41		1.4		
WSW	.3				.6					1.4		
W	2.1	.3			2.4	.6			4.2	2.8		
WNW	2.1	1.2	0.3	42	3.6	1.2						
NW	3.3	1.2			4.2	1.2			2.8	1.4		
NNW	1.8	.3			3.0	1.2			4.2		1.4	
Total	11.1	3.3	.3		16.2	4.8	.6		15.4	12.6	2.8	

AUTUMN

N									Insufficient data.			
NNE												
NE					4.3							
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	1.2											
WSW	1.2	1.2			4.3							
W	3.6				4.3	4.3						
WNW						4.3		30				
NW	3.6				4.3							
NNW		1.2		30								
Total	9.6	2.4			17.2	8.6						

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

SHERIDAN, WYO.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	1.2	0.4			5.2					12.6		36
NNE	1.6					2.6		32				
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.8	.4										
WSW	2.4	.4			5.2					6.3		
W	1.2	.8										
WNW	2.0	1.6										
NW	1.2	.8	.4	55								
NNW	2.4	1.2			5.2							
Total	12.8	5.6	.4		15.6	2.6				18.9		

SPRING

N		0.2			0.6	0.6	0.6	38			1.6	37
NNE	0.4											
NE									1.6			
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.4											
SW		.6			1.2				1.6			
WSW	1.8				1.2	.6						
W	.8	.2			1.8				1.6			
WNW	1.6	.6	0.2	50	1.2				1.6			
NW	1.2				1.2	1.2						
NNW	.6	.6			1.2					1.6		
Total	6.8	2.2	.2		8.4	2.4	.6		6.4	1.6	1.6	

SUMMER

N												
NNE												
NE									0.8			
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	0.2				0.3	0.3			.8			
SW	1.4	0.4			2.4				5.6	2.4		
WSW	3.2	.6			4.2	1.8			5.6	4.0	0.8	
W	3.2	.4	0.2	47	5.7	.9	0.6	40	2.4	.8		41
WNW	1.0	.8	.2									
NW	.6	.2			2.7	.6	.3		.8			
NNW					.3							
Total	9.6	2.4	.4		15.6	3.6	.9		16.0	7.2	.8	

AUTUMN

N		0.9			1.4					1.7	1.7	35
NNE							0.7		1.7			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW		.3			.7					1.7		
SW	0.9	.3			.7						1.7	
WSW	1.8	.6	0.3	57	4.2	2.1			3.4	1.7		
W	2.7	1.2	.9		3.5	.7	.7	38		1.7		
WNW	3.9	1.8	.3		2.8				1.7			
NW	2.1	.9			2.1							
NNW	.9	.6			1.4							
Total	12.3	6.6	1.5		16.8	2.8	1.4		6.8	6.8	3.4	

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

WASHINGTON, D. C.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N												
NNE	1.4											
NE												
ENE												
E												
ESE												
SE												
SSE												
S					Insufficient data.				Insufficient data.			
SSW												
SW												
WSW	1.4	1.4	1.4	40								
W	11.2	4.2										
WNW	5.6	1.4	1.4									
NW	7.0											
NNW												
Total	26.6	7.0	2.8									

SPRING

N	0.5											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.5											
SW	.5											
WSW									4.2			
W	3.5				1.3				4.2			
WNW	1.0					1.3		30				
NW	2.5	0.5		30					4.2			27
NNW												
Total	8.5	.5			1.3	1.3			12.6			

SUMMER

N	0.4				0.6							
NNE									2.6			
NE										1.3		
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.2											
SW												
WSW	1.0				1.2				1.3	2.6		32
W	.6				1.2				1.3			
WNW	.6	0.4		31								
NW	1.0								1.3			
NNW	.2				.6			27	1.3			
Total	4.0	.4			3.6				7.8	3.9		

AUTUMN

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.3	0.3							1.5			
WSW	.3	.3			1.4				1.5			
W	2.4	.6	0.3	37	2.8	0.7		29	3.0			27
WNW	1.8				2.1				4.5			
NW	.9											
NNW		.3			.7							
Total	5.7	1.5	.3		7.0	.7			10.5			

TABLE 5.—*Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions*—Continued

WINSLOW, ARIZ.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.	22–27	28–36	Over 36	Max.
N	1.0	0.6	0.4		1.1				2.0			
NNE	.2	.2	.2			1.1						
NE	.4								2.0			
ENE	.1	.1			1.1							
E												
ESE												
SE												
SSE												
S												
SSW	.1					1.1						
SW	1.0	1.7	.7		1.1		1.1		4.0		2.0	
WSW	1.8	.9	.5		3.3	3.3						
W	1.9	1.2	1.0		5.5	6.6	2.2		2.0	8.0	6.0	
WNW	1.1	1.7	.2	64	3.3	4.4	2.2		4.0	4.0	2.0	49
NW	1.7	.9	.4		3.3	1.1	2.2	47	2.0	2.0	4.0	
NNW	1.1	1.0	.3		2.2	1.1			2.0			
Total	10.4	8.3	3.7		20.9	18.7	7.7		18.0	14.0	14.0	

SPRING

N	0.5	0.7	0.1						5.6			
NNE		.1										
NE	.1											
ENE	.1											
E		.1										
ESE												
SE												
SSE	.1											
S	.2											
SSW	.4	.2	.1									
SW	1.0	1.0	.2		1.4	1.4				5.6		
WSW	1.4	.7	.1		4.2	2.8	1.4		11.2		5.6	38
W	1.6	1.2	.2		4.2	5.6	1.4	40				
WNW	.9	.7	.2			1.4						
NW	.8	.1			2.8	1.4			5.6			
NNW	.6	.4	.1	48					5.6			
Total	7.7	5.2	1.0		12.6	12.6	2.8		28.0	5.6	5.6	

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S	0.1											
SSW	.2	0.3		36	1.5	1.5		36				
SW	.8	.1							5.0			27
WSW	.2											
W	.1								2.5			
WNW												
NW												
NNW												
Total	1.4	.4			1.5	1.5			7.5			

AUTUMN

N	0.1	0.1	0.3									
NNE	.2	.2	.2						2.3	2.3		
NE		.1										
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.2	.1	.1			1.1						
SW	.4	.7	.2		1.1				2.3			
WSW	1.4	.2	.3			1.1						
W	.9	.4			4.4				2.3	2.3		34
WNW	.5	.3	.1	68	1.1					4.6		
NW	.8	.6	.2		2.2		2.2	43	4.6			
NNW	.4	.3				1.1						
Total	4.9	3.0	1.4		8.8	3.3	2.2		11.5	9.2		

TABLE 6.—*Annual total (all directions combined) percentage frequencies of velocities of 22–27 meters per second, 28–36 meters per second, and over 36 meters per second, respectively; also, maximum velocity and corresponding directions—stations grouped according to location in northern, middle, and southern sections of country*

STATIONS NORTH OF LATITUDE 41°

Station	6,000 meters				8,000 meters				10,000 meters			
	22–27	28–36	Over 36	Max. vel.	22–27	28–36	Over 36	Max. vel.	22–27	28–36	Over 36	Max. vel.
Burlington, Vt	8.4	2.2	0.6	W–41	6.9	1.1	1.1	WNW–38	4.8	3.2	0	SW–35.
Sault Ste. Marie, Mich	9.9	3.2	.5	W–49	14.2	7.1	.7	SW–41	12.5	10.9	1.6	NNE–48.
Lansing, Mich	8.2	2.5	1.0	NW–81	11.6	2.9	.4	NW–37	13.4	5.0	.8	WNW–40.
Madison, Wis	9.6	2.8	1.1	WNW–49	15.0	5.6	1.4	NW–58	10.5	1.2	1.2	NW–38.
Omaha, Nebr	5.1	1.2	.3	W–47	5.1	1.7	.4	W–38	8.8	2.5	.3	W–38.
Ellendale, N. Dak	12.3	5.3	1.3	NNW–50	15.2	7.1	1.1	NW–62	15.6	6.9	1.4	W–40.
Cheyenne, Wyo	6.7	1.7	.1	NW–46	5.6	1.2	0	S–36	4.4	1.5	.7	WSW–37.
Sheridan, Wyo	9.0	3.4	.5	WSW–57	14.0	3.1	.9	W–40	10.5	6.3	1.5	W–41.
Havre, Mont	11.0	4.3	.3	SW–47	8.8	2.7	.5	SW–38	9.2	3.7	.6	W–41.
Boise, Idaho	7.3	2.6	.5	WSW–44	9.6	3.7	.4	NNE–49	10.6	6.0	.4	WSW–38.
Portland, Oreg	6.8	2.3	.3	NNE–48	9.4	2.5	.8	NE–39	10.2	4.9	0	N–35.
Mean (percent)	8.3	2.8	.5		10.4	3.5	.7		10.5	5.0	.8	

STATIONS BETWEEN LATITUDES 35° AND 41° NORTH

Washington, D. C	7.1	1.2	.3	WSW–40	5.0	1.0	0	WNW–34	9.8	2.3	0.6	WNW–41.
Greensboro, N. C	3.6	2.0	.7	WSW–49	6.1	1.5	.2	NNE–38	7.7	2.9	1.2	NNE–50.
Royal Center, Ind	8.4	2.7	.4	W–53	8.8	3.0	1.2	WNW–48	14.0	4.3	1.7	NNW–46.
Evansville, Ind	3.2	.6	.2	W–38	4.5	.5	0	WSW–28	1.3	0	0	NW–22.
Memphis, Tenn	2.5	.6	.1	WSW–38	2.0	.5	0	WSW–28	2.1	0	0	NE–25.
Broken Arrow, Okla	6.5	4.3	1.1	NW–61	6.8	3.2	1.5	W–51	7.0	4.6	1.9	WNW–53.
Amarillo, Tex	4.8	2.0	.2	SW–40	5.8	2.1	.2	WSW–40	5.0	1.4	.5	W–37.
Modena, Utah	6.0	2.8	.4	NW–58	11.4	3.9	.3	N–40	9.1	3.6	2.2	W–48.
Redding, Calif	8.4	3.3	.9	NW–48	9.9	5.0	2.1	NW–60	12.5	6.4	1.9	NW–38.
San Francisco, Calif	1.9	1.0	.2	NW–47	4.6	.4	.2	NNW–46	7.3	3.5	0	SW–34.
Mean (percent)	5.8	2.6	.6		7.2	2.6	.8		8.4	4.2	1.3	

STATIONS BETWEEN LATITUDES 24° AND 35° NORTH

Due West, S. C	6.6	3.5	1.3	NW–61	5.0	3.3	1.1	W–55	6.2	2.2	1.0	WNW–59.
Jacksonville, Fla	3.6	1.2	0	WNW–35	3.6	2.0	.3	WSW–47	7.2	2.2	.3	WSW–37.
Key West, Fla	1.3	.2	0	W–31	3.6	1.8	.3	WNW–43	8.4	2.0	.6	W–38.
New Orleans, La	4.3	1.6	.1	WNW–40	6.0	1.9	0	W–34	11.6	6.1	1.4	W–43.
Groesbeck, Tex	6.5	3.6	.5	WNW–45	7.0	3.5	1.0	W–60	7.2	4.0	1.0	WNW–54.
Brownsville, Tex	2.2	.6	.1	SW–38	5.2	1.9	0	WNW–32	6.7	2.2	1.1	W–54.
El Paso, Tex	7.4	2.5	.5	SW–39	6.3	4.6	.7	W–46	10.2	3.6	1.8	NW–50.
Winslow, Ariz	7.0	4.8	1.7	WNW–68	11.7	9.5	3.5	NW–47	14.5	7.9	5.3	WNW–49.
Los Angeles, Calif	4.9	.7	0	NW–32	3.6	.6	.3	WSW–40	6.4	2.9	0	NW–32.
Mean (percent)	5.1	2.6	.7		5.5	3.0	.8		8.0	3.4	1.1	

This table shows that on the average the frequency of high velocities increases with latitude at all three levels and with altitude for all three groups of stations. With a very few exceptions, the highest velocity on record at each station occurred with a westerly wind. In table 7 the mean values for each group are combined to show frequency of winds of 22 meters per second or over, 28 meters per second or over, and over 36 meters per second, respectively.

TABLE 7.—*Percentage frequency of winds of 22 meters per second or over, 28 meters per second or over, and over 36 meters per second, respectively.*

Groups	6,000 meters			8,000 meters			10,000 meters		
	22 m. p. s. or over	28 m. p. s. or over	Over 36 m. p. s.	22 m. p. s. or over	28 m. p. s. or over	Over 36 m. p. s.	22 m. p. s. or over	28 m. p. s. or over	Over 36 m. p. s.
Northern	11.6	3.3	0.5	14.6	4.2	0.7	16.3	5.8	0.8
Middle	9.0	3.2	.6	10.6	3.4	.8	13.9	5.5	1.3
Southern	8.4	3.3	.7	9.3	3.8	.8	12.5	4.5	1.1

As may be seen, the frequency of wind velocities of 22 meters per second or over ranges from 8.4 percent at 6 kilometers over the southern section of the country to 16.3 percent at 10 kilometers over the northern section. The frequency of velocities of 28 meters per second or over, ranges from 3.2 percent at 6 kilometers over the middle section to 5.8 percent at 10 kilometers over the northern section, and the frequency of velocities of more than 36 meters per second ranges from 0.5 percent at 6 kilometers over the northern section to 1.3 percent at 10 kilometers over the middle section.

EXTREME VELOCITIES

In order that the record of extreme (highest on record) velocities may be shown as completely as possible, these data are given in table 8 for all Weather Bureau stations in the United States, including both the active and discontinued stations, and for all available records through July 1936. These data are shown by seasons, but with the individual month also given in which each observation occurred.

It will be noted that there is considerable variation in the highest recorded velocities, even between adjoining stations, due to the fact that observations reaching these altitudes were made very irregularly at all stations, and rarely at the same time or even the same day at two or more adjoining stations. An analysis of the table shows that winds of 50 meters per second (112 miles per hour) or over have been recorded at least once during the past several years at 30 different stations whose locations are well distributed over the country. With one exception (at Groesbeck, Tex.), these records are confined to the first three levels of 6, 8, and 10 kilometers. Extreme velocities of 60 meters per second (134 miles per hour) or over were recorded at 9 different stations; also fairly well distributed over the country. These records are confined to the two lower levels of 6 and 8 kilometers. The highest velocity for all stations was 81 meters per second (181 miles per hour) from the NW., recorded at 6 kilometers at Lansing, Mich., on the morning of December 17, 1919. Although this was a single-theodolite observation, an examination of the original record gives no reason to doubt its accuracy. This is verified, to some extent also, by the unusually rapid movement of a surface high-pressure area of 30.5 inches, which was centered at St. Paul, Minn., on the morning of this observation, and 24 hours later was centered at Philadelphia, Pa., nearly 1,000 miles away.

TABLE 8.—*Extreme velocities (meters per second), with directions and month of occurrence, for all Weather Bureau Pilot Balloon stations in the United States and for all records through July 1936, by seasons. One meter per second=2.24 miles per hour*

WINTER

Station	Yrs. rcd.	6,000 meters			8,000 meters			10,000 meters			12,000 meters			14,000 meters		
		Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.
Akron, Ohio	2	(1)			(1)			(1)			(1)			(1)		
Abilene, Tex	1	34	NW.	Feb.	33	W.	Jan.	45	W.	Feb.	22	W.	Dec.	(1)		
Albany, N. Y	7	33	NWW.	Dec.	30	WNW.	Feb.	21	NW.	Jan.	(1)			(1)		
Albuquerque, N. Mex	5	66	WSW.	Jan.	33	W.	Dec.	24	NNW.	Jan.	9	ESE.	Jan.	(1)		
Amarillo, Tex	4	40	SW.	Dec.	40	WSW.	Dec.	37	W.	Dec.	13	SE.	Jan.	(1)		
Atlanta, Ga	9	31	W.	Feb.	41	W.	Feb.	29	WSW.	Jan.	31	W.	Jan.	(1)		
Bellefonte, Pa	5	39	WNW.	Feb.	21	NNE.	Feb.	(1)			(1)			(1)		
Big Spring, Tex	4	41	NNW.	Jan.	36	W.	Dec.	50	WNW.	Jan.	20	W.	Feb.	26	WSW.	Feb.
Billings, Mont	2	35	NW.	Feb.	28	WNW.	Dec.	22	N.	Jan.	28	N.	Jan.	32	NNW.	Jan.
Bismarck, N. Dak	4	31	NW.	Feb.	25	NW.	Dec.	26	SE.	Feb.	25	W.	Jan.	(1)		
Boise, Idaho	10	39	N.	Feb.	42	WNW.	Jan.	29	NNE.	Jan.	13	WNW.	Dec.	(1)		
Boston, Mass	10	28	WSW.	Dec.	8	NW.	Feb.	22	NW.	Feb.	(1)			(1)		
Broken Arrow, Okla	12	50	W.	Feb.	50	W.	Jan.	40	W.	Dec.	37	WNW.	Feb.	36	WSW.	Dec.
Brownsville, Tex	7	38	SW.	Feb.	32	WNW.	Feb.	54	W.	Jan.	(1)			(1)		
Buffalo, N. Y	7	18	NW.	Feb.	14	N.	Dec.	(1)			(1)			(1)		
Burlington, Vt	17	41	W.	Feb.	37	WNW.	Feb.	19	NW.	Feb.	21	NW.	Feb.	(1)		
Charleston, S. C	4	48	W.	Feb.	40	SW.	Feb.	26	N.	Dec.	(1)			(1)		
Cheyenne, Wyo	10	46	NW.	Jan.	26	ENE.	Dec.	16	NNW.	Feb.	17	WSW.	Feb.	(1)		
Chicago, Ill	10	36	NW.	Jan.	(1)			(1)			(1)			(1)		
Cincinnati, Ohio	5	13	W.	Dec.	(1)			(1)			(1)			(1)		
Cleveland, Ohio	10	33	NW.	Jan.	25	SW.	Feb.	4	SSW.	Feb.	11	W.	Feb.	(1)		
Columbus, Ohio	5	43	W.	Jan.	38	NW.	Feb.	23	N.	Dec.	37	NNW.	Dec.	(1)		
Dallas, Tex	6	44	W.	Jan.	29	W.	Feb.	38	WNW.	Jan.	(1)			(1)		
Davenport, Iowa	10	29	WSW.	Feb.	46	WSW.	Jan.	50	NNW.	Feb.	(1)			(1)		
Del Rio, Tex	5	28	W.	Jan.	24	WSW.	Feb.	16	E.	Feb.	(1)			(1)		
Denver, Colo	17	39	W.	Dec.	42	NNW.	Dec.	52	W.	Dec.	23	W.	Dec.	30	W.	Feb.
Detroit, Mich	10	35	W.	Feb.	22	W.	Dec.	20	W.	Dec.	(1)			(1)		
Due West, S. C	11	61	NW.	Jan.	55	W.	Feb.	47	NW.	Jan.	42	W.	Feb.	(1)		
Elko, Nev	4	32	NW.	Dec.	16	W.	Feb.	11	ESE.	Jan.	4	SSW.	Jan.	(1)		
Ellendale, N. Dak	13	47	WNW.	Feb.	37	W.	Feb.	30	WNW.	Dec.	21	WNW.	Jan.	17	NW.	Feb.
El Paso, Tex	4	39	W.	Feb.	38	SW.	Dec.	40	W.	Feb.	44	NNE.	Feb.	29	W.	Dec.
Evansville, Ind	7	38	W.	Feb.	25	WNW.	Feb.	(1)			(1)			(1)		
Fargo, N. Dak	2	33	NW.	Feb.	46	N.	Dec.	21	WNW.	Jan.	(1)			(1)		
Fresno, Calif	7	28	W.	Jan.	21	N.	Feb.	(1)			(1)			(1)		
Greensboro, N. C	8	44	WNW.	Dec.	36	WNW.	Feb.	50	NNE.	Dec.	18	WSW.	Feb.	(1)		
Groesbeck, Tex	13	45	WNW.	Dec.	60	W.	Feb.	54	WNW.	Feb.	54	NW.	Jan.	24	WNW.	Dec.
Havre, Mont	9	32	WNW.	Jan.	32	W.	Feb.	25	NW.	Feb.	20	ENE.	Feb.	(1)		
Hollister, Calif	1	31	NNW.	Jan.	(1)			(1)			(1)			(1)		
Houston, Tex	5	33	W.	Dec.	32	WNW.	Dec.	38	WSW.	Dec.	30	W.	Dec.	(1)		
Indianapolis, Ind	4	39	WSW.	Dec.	24	WNW.	Feb.	21	W.	Jan.	25	W.	Jan.	(1)		
Ithaca, N. Y	10	32	WNW.	Feb.	29	NW.	Feb.	15	WNW.	Dec.	(1)			(1)		
Jackson, Miss	3	18	W.	Feb.	14	NW.	Jan.	(1)			(1)			(1)		
Jacksonville, Fla	10	33	W.	Feb.	29	WNW.	Feb.	24	WSW.	Feb.	9	WNW.	Jan.	(1)		
Kansas City, Mo	10	22	W.	Feb.	15	SSW.	Dec.	15	W.	Feb.	10	W.	Feb.	(1)		
Key West, Fla	16	30	WSW.	Dec.	43	WNW.	Feb.	38	W.	Feb.	41	WNW.	Feb.	34	W.	Jan.
Kingman, Ariz	1	31	WNW.	Dec.	30	WSW.	Dec.	(1)			(1)			(1)		
Knoxville, Tenn	9	31	W.	Dec.	20	W.	Jan.	24	W.	Dec.	(1)			(1)		
Kylertown, Pa	1	(1)			(1)			(1)			(1)			(1)		
Lansing, Mich	7	81	NW.	Dec.	28	NW.	Jan.	27	NW.	Feb.	10	ENE.	Dec.	(1)		
Las Vegas, Nev	1	50	WNW.	Jan.	34	WNW.	Feb.	41	WNW.	Feb.	(1)			(1)		
Lebec, Calif	3	32	WNW.	Feb.	(1)			(1)			(1)			(1)		
Leesburg, Ga	2	45	WNW.	Dec.	37	WNW.	Dec.	29	W.	Feb.	(1)			(1)		
Los Angeles, Calif	10	32	NW.	Dec.	28	NNW.	Dec.	32	NW.	Dec.	20	WNW.	Dec.	6	WSW.	Dec.
Madison, Wis	8	49	WNW.	Jan.	34	WNW.	Jan.	26	W.	Feb.	(1)			(1)		
Medford, Oreg	10	45	N.	Feb.	31	NNW.	Feb.	39	NE.	Feb.	20	NNE.	Feb.	(1)		
Memphis, Tenn	13	38	WSW.	Dec.	28	WSW.	Jan.	36	WSW.	Jan.	18	WSW.	Dec.	(1)		
Miami, Fla	6	35	WSW.	Feb.	20	W.	Dec.	32	WNW.	Dec.	12	W.	Jan.	(1)		
Missoula, Mont	1	27	NW.	Jan.	14	NW.	Dec.	8	NNW.	Dec.	(1)			(1)		
Modena, Utah	9	58	NW.	Dec.	40	N.	Jan.	31	NNE.	Jan.	22	NW.	Jan.	33	W.	Dec.
Murfreesboro, Tenn	3	31	WSW.	Dec.	16	NW.	Dec.	(1)			(1)			(1)		
Newark, N. J	10	22	W.	Feb.	(1)			(1)			(1)			(1)		
New Orleans, La	10	32	W.	Feb.	34	W.	Feb.	36	W.	Jan.	26	WNW.	Dec.	16	WNW.	Dec.
North Platte, Nebr	6	40	WNW.	Jan.	39	SSW.	Jan.	15	NNW.	Dec.	(1)			(1)		
Northport, Wash	1	26	NNE.	Jan.	12	NW.	Jan.	8	NNW.	Jan.	(1)			(1)		
Oklahoma City, Okla	10	47	WNW.	Jan.	40	WSW.	Dec.	(1)			(1)			(1)		
Omaha, Nebr	16	49	WNW.	Jan.	28	NNE.	Dec.	28	W.	Feb.	19	WNW	Jan.	20	WNW.	Jan.
Pasco, Wash	4	17	NW.	Feb.	16	NW.	Feb.	(1)			(1)			(1)		
Pembina, N. Dak	3	26	NW.	Jan.	51	NNW.	Jan.	(1)			(1)			(1)		
Pendleton, Oreg	1	23	N.	Dec.	(1)			(1)			(1)			(1)		
Phoenix, Ariz	6	50	NW.	Dec.	42	WSW.	Dec.	52	SW.	Dec.	13	WNW.	Dec.	(1)		
Pittsburgh, Pa	3	27	WNW.	Dec.	(1)			(1)			(1)			(1)		
Portland, Oreg	8	48	NNE.	Jan.	39	NE.	Dec.	35	N.	Dec.	36	W.	Jan.	15	WSW.	Feb.
Redding, Calif	7	48	NE.	Dec.	48	NNW.	Dec.	58	NW.	Dec.	27	NNW.	Jan.	19	NNW.	Feb.
Reno, Nev	9	56	NW.	Jan.	39	WSW.	Feb.	43	NW.	Feb.	(1)			(1)		
Richmond, Va	3	11	WNW.	Feb.	(1)			(1)			(1)			(1)		
Rock Springs, Wyo	4	53	WSW.	Jan.	58	N.	Jan.	34	NW.	Dec.	12	NW.	Feb.	(1)		
Royal Center, Ind	13	40	NW.	Dec.	48	WNW.	Dec.	46	NNW.	Jan.	21	WNW.	Jan.	(1)		
St. Louis, Mo	10	39	W.	Feb.	13	WSW.	Feb.	15	WNW.	Dec.	(1)			(1)		
St. Paul, Minn	10	36	WNW.	Feb.	24	NW.	Feb.	17	W.	Feb.	(1)			(1)		
Salt Lake City, Utah	10	49	NW.	Jan.	34	NE.	Feb.	25	NE.	Feb.	18	NNE.	Feb.	(1)		
Sandberg, Calif	4	64	NNW.	Dec.	28	NNW.	Jan.	29	WSW.	Dec.	(1)			(1)		
San Diego, Calif	5	35	SW.	Jan.	30	NW.	Jan.	40	SSW.	Dec.	(1)			(1)		
San Francisco, Calif	15	33	ENE.	Feb.	46	NNW.	Feb.	30	NNW.	Jan.	24	WNW.	Dec.	21	WNW.	Jan.
Sault Ste. Marie, Mich	10	31	NNW.	Feb.	28	WNW.	Feb.	20	W.	Feb.	(1)			(1)		
Seattle, Wash	10	53	NW.	Dec.	34	SW.	Feb.	34	NW.	Dec.	25	NE.	Dec.	34	SW.	Feb.
Sheridan, Wyo	7	55	NW.	Jan.	32	NNE.	Feb.	36	N.	Feb.	29	NNW.	Jan.	11	NW.	Feb.
Spartanburg, S. C	4	20	W.	Jan.	13	NNW.	Dec.	13	NNW.	Dec.	(1)			(1)		
Spokane, Wash	10	50	NW.	Feb.	34	W.	Feb.	27	NW.	Jan.	22	NW.	Feb.	(1)		
Tampa, Fla	5	29	WSW.	Feb.	23	WNW.	Jan.	32	WNW.	Jan.	16	NNW.	Jan.	(1)		
Tucson, Ariz	1	34	W.	Feb.	39	WSW.	Feb.	13	NW.	Feb.	(1)			(1)		
Tulsa, Okla	2	44	W.	Feb.	36	W.	Feb.	(1)			(1)			(1)		
Vicksburg, Miss	1	41	W.	Jan.	34	WSW.	Jan.	(1)			(1)			(1)		
Washington, D. C	18	40	WSW.	Jan.	34	WNW.	Dec.	41	WNW.	Dec.	(1)			(1)		
Wichita, Kans	6	37	WSW	Jan.	36	W.	Feb.	33	NNE.	Dec.	14	N.	Feb.	(1)		
Winnemucca, Nev	1	22	W.	Jan.	16	NNW.	Feb.	(1)			(1)			(1)		
Winslow, Ariz	5	64	WNW.	Feb.	47	NW.	Jan.	49	WNW.	Jan.	42	N.	Jan	38	NNE.	Dec.
Yakima, Wash	1	22	N.	Jan.	8	NNE.	Jan.	5	N.	Feb.	(1)			(1)		

[1] No data available for these levels.

TABLE 8.—*Extreme velocities (meters per second), with directions and month of occurrence, for all Weather Bureau Pilot Balloon stations in the United States and for all records through July 1936, by seasons. One meter per second=2.24 miles per hour*—Continued

SPRING

Station	Yrs. rcd.	6,000 meters			8,000 meters			10,000 meters			12,000 meters			14,000 meters		
		Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.
Akron, Ohio	2	(1)			(1)			(1)			(1)			(1)		
Abilene, Tex	1	26	WSW.	May	35	SW.	Apr.	21	W.	Mar.	30	NW.	May	(1)		
Albany, N. Y	7	44	WSW.	Apr.	30	NW.	May	53	WSW.	May	18	SW.	May	(1)		
Albuquerque, N. Mex	5	44	WSW.	Apr.	38	WNW.	Mar.	29	WNW.	Apr.	9	NE.	May	(1)		
Amarillo, Tex	4	37	WSW.	Mar.	25	WNW.	Mar.	22	WNW.	Mar.	21	SW	Mar.	20	SSE.	Mar.
Atlanta, Ga	9	41	WNW	Mar.	50	WNW.	Mar.	42	W.	Mar.	33	WSW.	Apr.	11	NW.	May
Bellefonte, Pa	5	23	WSW.	Apr.	35	SW.	Mar.	32	NE.	May	6	NE.	May	(1)		
Big Spring, Tex	4	37	N.	Mar.	27	WSW.	Mar.	20	NNW.	Apr.	26	W.	Mar.	(1)		
Billings, Mont	2	40	NNW.	Mar.	26	NW.	May	21	W.	May	27	W.	May	11	WNW.	May
Bismarck, N. Dak	4	34	W.	Mar.	31	NW.	Apr.	20	N.	May	15	W.	May	9	N.	Mar.
Boise, Idaho	10	37	NW.	Apr.	37	NE.	May	29	NNW.	May	32	S.	Apr.	29	SSE.	Mar.
Boston, Mass	10	33	W.	May	32	WSW.	May	29	NW.	Mar.	12	NNW.	May	(1)		
Broken Arrow, Okla	12	58	SW.	Apr.	51	W.	Mar.	53	WNW.	Apr.	34	WNW.	May	19	W.	May
Brownsville, Tex	7	32	WSW.	Apr.	30	W.	May	29	NW.	May	30	NW.	May	23	SW.	May
Buffalo, N. Y	7	40	SW.	Apr.	32	SW.	Mar.	19	NNW.	May	8	W.	Apr.	(1)		
Burlington, Vt	17	41	WNW	May	38	WNW.	Mar.	17	WNW.	Mar.	19	WSW.	May	16	W.	May
Charleston, S. C	4	26	NW.	Mar.	37	WNW.	Apr.	33	W.	May	27	WNW.	May	23	NNE.	May
Cheyenne, Wyo	10	42	NW.	Mar.	29	W.	Apr.	20	NW.	Mar.	43	W.	Mar.	25	ESE.	May
Chicago, Ill	10	31	WNW.	Apr.	43	NW.	Apr.	25	NW.	May	(1)			(1)		
Cincinnati, Ohio	5	33	WNW.	Apr.	11	WNW.	May	22	NW.	May	11	SSE.	Mar.	(1)		
Cleveland, Ohio	10	38	WNW.	May	28	W.	May	28	WNW.	May	42	WNW.	May	(1)		
Columbus, Ohio	5	37	W.	Mar.	26	NW.	May	29	WNW.	May	20	NW.	Apr.	28	WNW.	Apr.
Dallas, Tex	6	38	WSW.	Apr.	32	W.	May	31	W.	May	20	W.	May	(1)		
Davenport, Iowa	10	45	WNW.	Mar.	36	WSW.	May	32	N.	May	15	WSW.	May	22	W.	May
Del Rio, Tex	5	25	WSW.	Mar.	18	W.	May	17	N.	Apr.	(1)			(1)		
Denver, Colo	17	32	NW.	Mar.	48	WSW.	Mar.	30	WNW.	Mar.	(1)			(1)		
Detroit, Mich	10	46	NNW.	Apr.	49	NW.	Mar.	32	NNW.	May	18	SW.	Mar.	17	N.	May
Due West, S. C	11	49	WNW.	Mar.	48	WSW.	Mar.	39	WSW.	Mar.	30	W.	May	19	SW.	May
Elko, Nev	4	30	NNW.	Mar.	21	ENE.	Apr.	10	NNW.	Apr.	(1)			(1)		
Ellendale, N. Dak	13	38	NW.	Apr.	37	W.	Mar.	30	WSW.	Apr.	36	NNW.	May	27	NE.	May
El Paso, Tex	4	36	WNW.	Apr.	38	WSW.	May	30	WNW.	Apr.	40	WNW.	Apr.	16	WNW.	May
Evansville, Ill	7	32	WNW.	May	24	NNW.	Apr.	22	NW.	Apr.	28	WNW.	Apr.	17	WNW.	Apr.
Fargo, N. Dak	2	30	NW.	Mar.	24	WNW.	May	13	NW.	May	10	WSW.	May	(1)		
Fresno, Calif	7	34	WNW.	Apr.	30	WNW.	May	(1)			(1)			(1)		
Greensboro, N. C	8	49	WSW.	Mar.	38	NNE.	May	35	WNW.	Apr.	35	W.	May	28	W.	Apr.
Groesbeck, Tex	13	41	WNW.	Mar.	51	W.	Mar.	44	WSW.	Mar.	32	W.	May	20	WNW.	May
Havre, Mont	9	39	NW.	Mar.	37	W.	May	41	W.	May	24	WSW.	May	6	W.	Mar.
Hollister, Calif	1	(1)			(1)			(1)			(1)			(1)		
Houston, Tex	5	28	SW.	Apr.	28	W.	Mar.	15	WNW.	Apr.	19	WNW.	May	(1)		
Indianapolis, Ind	4	32	WNW.	Apr.	40	W.	Apr.	32	W.	Apr.	18	WNW	May	15	ESE.	Apr.
Ithaca, N. Y	10	30	SW.	Mar.	32	NW.	Mar.	15	NE.	Mar.	9	SW.	May	(1)		
Jackson, Miss	3	28	NW.	Mar.	14	NW.	May	26	NW.	Apr.	(1)			(1)		
Jacksonville, Fla	10	35	WNW.	Mar.	47	W&W.	Mar.	31	W.	Apr.	36	WNW.	May.	22	NNE.	May
Kansas City, Mo	10	35	WSW.	Apr.	22	W.	May	14	E.	May	19	N.	May	(1)		
Key West, Fla	16	31	W.	Mar.	42	W.	Mar.	31	WNW.	May	36	W.	Apr.	28	WNW.	May
Kingman, Ariz	1	32	NW.	Apr.	28	N.	Apr.	(1)			(1)			(1)		
Knoxville, Tenn	9	37	WNW.	Mar.	27	W.	Mar.	27	WNW.	Mar.	(1)			(1)		
Kylertown, Pa	1	18	W.	May	(1)			(1)			(1)			(1)		
Lansing, Mich	7	50	WNW.	May	37	NW.	May	28	WSW.	Mar.	29	N.	May	19	WSW.	May
Las Vegas, Nev	1	33	WNW.	Apr.	54	WNW.	Mar.	28	WNW.	May	19	NNW.	May	10	NW.	May
Lebec, Calif	3	28	NW.	Mar.	23	NNW.	Apr.	22	WNW.	Apr.	22	WSW.	Apr.	29	WNW.	Apr.
Leesburg, Ga	2	32	W.	Mar.	32	W.	Mar.	18	NNW.	Mar.	(1)			(1)		
Los Angeles, Calif	10	33	W.	Mar.	26	NNW.	Mar.	30	WSW	May	18	WNW.	Mar.	15	WSW.	Mar.
Madison, Wis	8	38	WNW.	Mar.	46	NW.	May	38	NW.	May	38	W.	Apr.	20	NW.	May
Medford, Oreg	10	45	N.	Mar.	50	N.	Mar.	41	N.	May	27	W.	Apr.	24	W.	May
Memphis, Tenn	13	27	WSW.	Apr.	20	WNW.	Apr.	20	WNW.	Apr.	15	W.	Apr.	22	NE.	May
Miami, Fla	6	31	WNW.	Mar.	22	W.	May	28	W.	May	27	W.	May	(1)		
Missoula, Mont	1	24	WSW.	Mar.	17	WNW.	Apr.	17	W.	Apr.	(1)			(1)		
Modena, Utah	9	43	NW.	May	30	NW.	Mar.	37	WNW.	May	35	NNW.	Apr.	29	S.	Mar.
Murfreesboro, Tenn	3	26	W.	Mar.	17	WNW.	May	32	NW.	Apr.	6	NNE.	May	(1)		
Newark, N. J	10	33	SW.	Mar.	21	NNW.	Apr.	13	NW.	May	4	NW.	May	(1)		
New Orleans, La	10	40	WNW.	Apr.	33	WNW.	Apr.	43	W.	Apr.	31	W.	Apr.	43	WNW.	May
North Platte, Nebr	6	39	NNW.	Mar.	37	SW.	May	18	SW.	May	9	W.	Apr.	(1)		
Northport, Wash	1	28	NW.	Mar.	13	WNW.	Mar.	4	S.	May	(1)			(1)		
Oklahoma City, Okla	10	39	WNW.	Mar.	21	NW.	May	12	NW.	May	(1)			(1)		
Omaha, Nebr	16	31	NNW.	Mar.	38	W.	May	33	SW.	May	17	WNW.	Apr.	19	N.	Apr.
Pasco, Wash	4	20	NW.	Apr.	15	NNE.	Mar.	12	NE.	Apr.	(1)			(1)		
Pembina, N. Dak	3	36	NW.	Mar.	36	W.	Apr.	32	WNW.	Mar.	9	WSW.	Mar.	(1)		
Pendleton, Oreg	1	34	NW.	Mar.	19	WNW.	Mar.	19	NE.	Mar.	10	W.	Apr.	(1)		
Phoenix, Ariz	6	30	WNW.	Apr.	34	WNW.	Apr.	22	NW.	Apr.	16	WNW.	Apr.	(1)		
Pittsburgh, Pa	3	25	NW.	May	13	WNW.	Apr.	13	WSW.	Apr.	7	S.	Apr.	(1)		
Portland, Oreg	8	31	NNW.	Mar.	38	W.	May	33	WNW.	Apr.	28	WNW.	Apr.	18	SW.	Mar.
Redding, Calif	7	48	NNW.	May	60	NW.	May	30	N.	May	30	NE.	Apr.	15	NW.	Apr.
Reno, Nev	9	47	WNW.	Mar.	37	WNW.	Apr.	27	WNW.	Mar.	(1)			(1)		
Richmond, Va	3	26	W.	May	8	WNW.	Apr.	11	NNE.	May	(1)			(1)		
Rock Springs, Wyo	4	49	NW.	Mar.	65	N.	Mar.	43	SW.	Mar.	34	W.	Mar.	16	NW.	Apr.
Royal Center, Ind	13	39	SW.	Mar.	42	SW.	Mar.	44	WNW.	Mar.	36	WNW.	May	28	NW.	May
St. Louis, Mo	10	24	WNW.	Apr.	14	W.	May	(1)			(1)			(1)		
St. Paul, Minn	10	30	NW.	Mar.	27	W.	Mar.	25	W.	May	15	WSW.	May	(1)		
Salt Lake City, Utah	10	48	W.	Apr.	28	N.	Apr.	31	NW.	Apr.	33	WSW.	May	35	SW.	Mar.
Sandberg, Calif	4	38	SSW.	May	25	WSW.	Mar.	29	NW.	Apr.	20	W.	May	(1)		
San Diego, Calif	5	28	WNW.	Apr.	30	WSW.	Mar.	16	WNW.	May	(1)			(1)		
San Francisco, Calif	15	29	WNW.	Mar.	22	SE.	Apr.	22	W.	May	16	W.	May	11	W.	Mar.
Sault Ste. Marie, Mich	10	49	W.	Apr.	38	NW.	Apr.	35	WNW.	Mar.	45	W.	May	8	W.	May
Seattle, Wash	10	36	NNW.	Mar.	37	NNE.	May	20	W.	Mar.	16	WNW.	Apr.	(1)		
Sheridan, Wyo	7	50	WNW.	Mar.	38	N.	Apr.	37	N.	Mar.	34	W.	May	28	SSE.	May
Spartanburg, S. C	4	35	WSW.	Apr.	30	WNW.	Apr.	29	SSW.	May	18	NE.	May	13	NNW.	May
Spokane, Wash	10	36	NNW.	Apr.	30	WNW.	Mar.	27	WNW.	May	20	WNW.	Apr.	12	WSW.	Mar.
Tampa, Fla	5	28	W.	Mar.	36	W.	Mar.	29	NW.	Mar.	31	WNW.	Apr.	25	NW.	May
Tucson, Ariz	1	56	SW.	May	49	SW.	May	30	WSW.	Mar.	(1)			(1)		
Tulsa, Okla	2	43	WSW.	May	34	W.	May	27	NW.	Mar.	19	W.	Apr.	(1)		
Vicksburg, Miss	1	30	W.	Mar.	30	W.	Mar.	21	NW.	May	19	WSW.	Apr.	(1)		
Washington, D. C	18	30	NW.	May	30	WNW.	Apr.	27	NW.	Mar.	21	W.	May	9	WNW.	Apr.
Wichita, Kans	6	46	W.	Mar.	37	NNW.	May	31	SW.	Mar.	20	WNW.	May	13	WNW.	May
Winnemucca, Nev	1	28	NNW.	Apr.	30	NNW.	Mar.	19	SW.	Apr.	13	W.	Mar.	(1)		
Winslow, Ariz	5	48	NNW.	Mar.	40	W.	Mar.	38	WSW.	Mar.	30	W.	Mar.	22	WSW.	May
Yakima, Wash	1	21	NNW.	Apr.	12	WSW.	Apr.	(1)			(1)			(1)		

[1] No data available for these levels.

TABLE 8.—*Extreme velocities (meters per second), with directions and month of occurrence, for all Weather Bureau Pilot Balloon stations in the United States and for all records through July 1936, by seasons. One meter per second=2.24 miles per hour*—Continued

SUMMER

Station	Yrs. rcd.	6,000 meters			8,000 meters			10,000 meters			12,000 meters			14,000 meters		
		Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.
Akron, Ohio	2	21	SW.	July	29	NNW.	June	21	NNE.	June	11	WNW.	June	(1)		
Abilene, Tex	1	18	W.	June	21	NNE.	June	20	SE.	Aug.	14	W.	June	18	NE.	Aug.
Albany, N. Y	7	36	WSW.	Aug.	31	W.	Aug.	26	NNE.	July	23	NNW.	Aug.	(1)		
Albuquerque, N. Mex	5	31	W.	June	18	NW.	June	14	NE.	Aug.	21	W.	Aug.	10	S.	Aug.
Amarillo, Tex	4	26	W.	June	31	WNW.	June	26	W.	July	30	NE.	June	27	NNW.	Aug.
Atlanta, Ga	9	23	NNW.	June	24	W.	June	22	E.	July	24	NW.	July	24	W.	July
Bellefonte, Pa	5	30	NW.	July	31	WSW.	Aug.	36	WSW.	July	24	WSW.	Aug.	20	NW.	July
Big Spring, Tex	4	28	NW.	June	17	WNW.	June	19	W.	June	24	NE.	Aug.	13	E.	Aug.
Billings, Mont	2	34	W.	June	39	W.	June	32	WNW.	Aug.	22	W.	July	16	WSW.	July
Bismarck, N. Dak	4	31	WNW.	June	31	W.	July	28	WNW.	July	13	NW.	July	(1)		
Boise, Idaho	10	44	WSW.	June	36	WSW.	Aug.	34	SSW.	Aug.	24	W.	Aug.	30	WSW.	Aug.
Boston, Mass	10	36	WSW.	Aug.	31	WSW.	Aug.	39	NNE.	Aug.	13	WNW.	July	(1)		
Broken Arrow, Okla	12	29	NW.	June	28	NW.	June	32	NW.	July	35	WNW.	July	25	NNW.	July
Brownsville, Tex	7	21	N.	June	22	W.	June	26	W.	June	33	WSW.	June	22	E.	Aug.
Buffalo, N. Y	7	30	NNW.	June	17	WNW.	Aug.	20	WNW.	Aug.	22	NW.	July	(1)		
Burlington, Vt	17	33	NW.	June	30	NNW.	June	27	NNW.	June	32	W.	July	(1)		
Charleston, S. C	4	35	WSW.	June	24	N.	Aug.	23	WNW.	July	22	NW.	June	20	NNE.	June
Cheyenne, Wyo	10	34	WNW.	June	36	S.	June	37	WSW.	June	25	WNW.	Aug.	14	SSW.	June
Chicago, Ill	10	34	NW.	June	26	W.	June	23	NNW.	June	6	WNW.	July	3	NW.	July
Cincinnati, Ohio	5	18	WNW.	July	22	NNE.	Aug.	(1)			(1)			(1)		
Cleveland, Ohio	10	40	WNW.	June	29	SSW.	June	33	SW.	Aug.	23	NW.	Aug.	15	NNW.	Aug.
Columbus, Ohio	5	31	WNW.	Aug.	35	N.	June	44	NNW.	June	25	WSW.	June	(1)		
Dallas, Tex	6	24	WNW.	June	23	NE.	July	30	NW.	Aug.	21	ENE.	Aug.	10	NE.	Aug.
Davenport, Iowa	10	34	S.	June	28	N.	July	34	N.	Aug.	31	NW.	June	21	W.	July
Del Rio, Tex	5	24	NNW.	June	22	NW.	June	17	E.	July	14	ESE.	July	13	S.	July
Denver, Colo	17	36	SSW.	June	36	W.	July	26	W.	July	29	SSW.	June	16	N.	July
Detroit, Mich	10	36	W.	July	45	SW.	June	46	W.	July	28	W.	July	5	NNW.	July
Due West, S. C	11	30	NNW.	June	29	SW.	Aug.	27	W.	Aug.	30	WSW.	June	27	NW.	June
Elko, Nev	4	31	NW.	Aug.	21	NNE.	June	8	WSW.	July	(1)			(1)		
Ellendale, N. Dak	13	33	WSW.	July	40	W.	Aug.	40	W.	Aug.	26	NW.	Aug.	24	WNW.	Aug.
El Paso, Tex	4	28	SW.	June	23	WSW.	June	23	W.	June	21	WSW	June	(1)		
Evansville, Ind	7	25	NNW.	June	26	WNW.	June	21	W.	June	16	N.	Aug.	16	W.	Aug.
Fargo, N. Dak	2	23	W.	July	27	NW.	June	8	SW.	July	(1)			(1)		
Fresno, Calif	7	25	SW.	July	25	W.	July	18	WSW.	July	(1)			(1)		
Greensboro, N. C	8	33	NNW.	July	46	SW.	June	34	NNW.	July	30	NW.	July	31	NNW.	June
Groesbeck, Tex	13	23	NW.	June	25	W.	June	36	NW.	June	35	WSW.	June	24	WNW.	July
Havre, Mont	9	47	SW.	July	31	W.	June	35	SW.	Aug.	32	NW.	July	14	NW.	Aug.
Hollister, Calif	1	21	SSW.	July	20	SSW.	July	18	N.	Aug.	(1)			(1)		
Houston, Tex	5	28	NNE.	June	18	ENE.	June	24	SE.	Aug.	27	WNW.	June	21	NW.	June
Indianapolis, Ind	4	26	WSW.	June	47	WNW.	June	34	WNW.	Aug.	30	NNW.	July	21	NNW.	Aug.
Ithaca, N. Y	10	41	WNW.	June	24	SW.	July	26	SW.	July	12	S.	July	(1)		
Jackson, Miss	3	14	NNW.	June	10	NNW.	June	14	NNW.	June	20	NNW.	June	(1)		
Jacksonville, Fla	10	22	WNW.	June	28	W.	Aug.	30	W.	June	30	ENE.	Aug.	29	E.	Aug.
Kansas City, Mo	10	30	N.	June	27	NNW.	June	24	N.	Aug.	30	NW.	June	14	NNW.	Aug.
Key West, Fla	16	18	E.	Aug.	26	W.	June	38	SW.	June	20	NNW.	July	24	W.	Aug.
Kingman, Ariz	1	25	WSW.	July	11	WSW.	July	18	SW.	Aug.	18	SW.	Aug.	(1)		
Knoxville, Tenn	9	24	N.	June	28	W.	July	31	W.	June	27	NW.	June	29	WNW.	June
Kylertown, Pa	1	24	WNW.	July	19	N.	July	27	N.	July	(1)			(1)		
Lansing, Mich	7	27	NW.	July	29	NNW.	Aug.	31	W.	July	26	NW.	June	(1)		
Las Vegas, Nev	1	25	WSW.	June	26	WNW.	June	22	SW.	Aug.	24	NW.	June	43	NW.	June
Lebec, Calif	3	21	SW.	June	11	SW.	June	(1)			(1)			(1)		
Leesburg, Ga	2	19	W.	June	17	NNW.	June	16	W.	July	28	NE.	July	(1)		
Los Angeles, Calif	10	23	SW.	June	30	SW.	June	24	WSW.	June	38	SSW.	Aug.	19	W.	July
Madison, Wis	8	32	W.	June	29	N.	Aug.	28	NW.	July	13	N.	July	10	NW.	June
Medford, Oreg	10	34	WSW.	July	43	NNW.	Aug.	40	W.	July	36	W.	July	23	SW.	Aug.
Memphis, Tenn	13	33	W.	July	20	NNE.	June	25	NE.	June	18	N.	July	14	W.	June
Miami, Fla	6	18	SW.	Aug.	17	NNW.	July	21	ESE.	Aug.	25	ESE.	Aug.	20	ENE.	July
Missoula, Mont	1	30	SW.	June	18	W.	June	21	S.	July	(1)			(1)		
Modena, Utah	9	31	SW.	June	30	SW.	June	36	W.	Aug.	32	W.	Aug.	20	N.	Aug.
Murfreesboro, Tenn	3	23	NNW.	June	31	SW.	Aug.	20	W.	June	30	WSW.	July	32	WSW.	July
Newark, N. J	10	30	WSW.	July	25	WNW.	June	29	WNW.	Aug.	28	W.	Aug.	(1)		
New Orleans, La	10	18	WNW.	Aug.	20	WSW.	June	31	W.	June	23	NNW.	June	(1)		
North Platte, Nebr	6	31	WNW.	July	26	NW.	Aug.	29	NW.	Aug.	30	W.	June	5	WSW.	June
Northport, Wash	1	32	WSW.	July	25	W.	July	(1)			(1)			(1)		
Oklahoma City, Okla	10	29	NW.	June	26	WNW.	June	16	WSW.	June	12	SSW.	June	4	NNW.	June
Omaha, Nebr	16	28	NW.	June	31	WNW.	June	33	NNW.	June	25	NW.	July	30	N.	July
Pasco, Wash	4	17	NNW.	June	22	NNE.	June	(1)			(1)			(1)		
Pembina, N. Dak	3	30	NW.	July	(1)			(1)			(1)			(1)		
Pendleton, Oreg	1	32	SSW.	July	15	WNW.	Aug.	(1)			(1)			(1)		
Phoenix, Ariz	6	28	SW.	June	22	SW.	July	17	WNW.	June	13	N.	June	10	SSE.	Aug.
Pittsburgh, Pa	3	25	WNW.	Aug.	13	NNW.	July	14	NW.	Aug.	(1)			(1)		
Portland, Oreg	8	41	SSW.	June	40	SW.	June	31	WSW.	July	30	SSW.	July	26	WNW.	Aug.
Redding, Calif	7	37	NW.	June	37	N.	July	40	NE.	June	37	WSW.	July	20	NW.	Aug.
Reno, Nev	9	40	SSW.	July	40	SW.	July	40	WSW.	July	23	W.	July	8	SSW.	July
Richmond, Va	3	29	SSW.	July	20	W.	Aug.	14	SW.	June	10	NE.	July	(1)		
Rock Springs, Wyo	4	46	NW.	June	38	SSW.	June	36	NW.	June	36	SW.	June	20	SW.	June
Royal Center, Ind	13	30	NW.	July	31	NW.	June	34	NW.	Aug.	36	NNW.	June	17	NNE.	June
St. Louis, Mo	10	21	WNW.	June	28	W.	June	20	W.	June	13	ESE.	July	(1)		
St. Paul, Minn	10	30	WSW.	July	27	W.	Aug.	29	NW.	June	7	WNW.	July	1	N.	July
Salt Lake City, Utah	10	37	WNW.	June	27	WNW.	Aug.	27	WSW.	July	30	WSW.	Aug.	15	SW.	June
Sandberg, Calif	4	25	SW.	June	25	W.	June	25	SW.	Aug.	16	NW.	Aug.	(1)		
San Diego, Calif	5	24	SSW.	June	25	WSW.	June	19	SSW.	Aug.	13	SSW.	Aug.	12	NNW.	Aug.
San Francisco, Calif	15	25	N.	June	40	NNW.	July	30	WSW.	Aug.	31	SW.	Aug.	20	WSW.	Aug.
Sault Ste. Marie, Mich	10	42	WNW.	June	41	SW.	July	48	NNE.	Aug.	42	NNW.	July	24	NW.	July
Seattle, Wash	10	49	SSW.	Aug.	36	SW.	June	44	W.	July	31	SW.	July	19	WSW.	Aug.
Sheridan, Wyo	7	47	W.	June	40	W.	June	41	W.	Aug.	29	NE.	Aug.	14	NE.	July
Spartanburg, S. C	4	18	WSW.	July	27	N.	July	18	ENE.	Aug.	12	N.	July	11	N.	July
Spokane, Wash	10	33	W.	July	36	W.	July	22	WNW.	Aug.	13	ENE.	Aug.	13	WNW.	Aug.
Tampa, Fla	5	25	WNW.	June	30	WNW.	June	24	NE.	Aug.	22	ENE.	Aug.	17	ENE.	Aug.
Tucson, Ariz	1	15	WSW.	June	10	N.	June	14	WSW.	June	(1)			(1)		
Tulsa, Okla	2	25	N.	Aug.	26	ENE.	June	24	NNE.	June	32	NW.	June	31	N.	June
Vicksburg, Miss	1	17	NNW.	June	24	N.	June	23	N.	June	14	W.	June	(1)		
Washington, D. C	18	31	WNW.	June	29	WNW.	Aug.	32	WSW.	June	37	N.	Aug.	12	NNE.	Aug.
Wichita, Kans	6	25	NW.	June	26	NW.	June	22	WSW.	Aug.	30	WSW.	Aug.	17	WNW.	July
Winnemucca, Nev	1	28	SSW.	June	27	WSW.	June	17	W.	July	(1)			(1)		
Winslow, Ariz	5	38	WSW.	June	36	SSW.	June	27	SW.	June	29	W.	June	29	S.	July
Yakima, Wash	1	26	WSW.	June	18	SW.	July	18	NE.	June	(1)			(1)		

[1] No data available for these levels.

TABLE 8.—*Extreme velocities (meters per second), with directions and month of occurrence, for all Weather Bureau Pilot Balloon stations in the United States and for all records through July 1936, by seasons. One meter per second=2.24 miles per hour*—Continued

AUTUMN

Station	Yrs. rcd.	6,000 meters			8,000 meters			10,000 meters			12,000 meters			14,000 meters		
		Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.
Akron, Ohio	2	[1]			[1]			[1]			[1]			[1]		
Abilene, Tex	1	24	W.	Oct.	28	W.	Oct.	37	W.	Sept.	38	WSW.	Sept.	19	WNW.	Sept.
Albany, N. Y	7	42	WNW.	Oct.	48	WNW.	Oct.	25	NNW.	Sept.	40	S.	Nov.	[1]		
Albuquerque, N. Mex	5	48	NW.	Nov.	37	WNW.	Nov.	43	WSW.	Nov.	21	WNW.	Nov.	[1]		
Amarillo, Tex	4	37	WSW.	Nov.	34	W.	Nov.	32	WNW.	Nov.	24	NW.	Nov.	13	WNW.	Sept.
Atlanta, Ga	9	27	WSW.	Nov.	26	NW.	Oct.	31	W.	Oct.	28	WSW.	Sept.	16	NW.	Oct.
Bellefonte, Pa	5	32	NE.	Nov.	23	WSW.	Sept.	24	N.	Sept.	28	N.	Sept.	[1]		
Big Spring, Tex	4	28	NW.	Nov.	24	WSW.	Oct.	34	WSW.	Oct.	27	W.	Sept.	24	W.	Sept.
Billings, Mont	2	32	WSW.	Nov.	27	NE.	Oct.	3	SSE.	Oct.	19	NE.	Oct.	[1]		
Bismarck, N. Dak	4	33	NW.	Oct.	40	NNW.	Oct.	26	NE.	Oct.	22	SW.	Nov.	8	NNW.	Oct.
Boise, Idaho	10	41	N.	Oct.	49	NNE.	Oct.	38	WSW.	Sept.	38	NW.	Oct.	23	WNW.	Oct.
Boston, Mass	10	50	WNW.	Oct.	24	W.	Sept.	29	WNW.	Sept.	28	W.	Sept.	[1]		
Broken Arrow, Okla	12	47	WNW.	Oct.	50	W.	Oct.	49	WSW.	Nov.	46	WNW.	Oct.	34	NW.	Oct.
Brownsville, Tex	7	23	WSW.	Nov.	27	N.	Sept.	23	W.	Oct.	25	W.	Oct.	19	SW.	Oct.
Buffalo, N. Y	7	28	W.	Oct.	6	ESE.	Sept.	[1]			[1]			[1]		
Burlington, Vt	17	40	SW.	Oct.	30	SW.	Oct.	35	SW.	Sept.	35	N.	Sept.	32	NW.	Sept.
Charleston, S. C	4	38	WSW.	Nov.	30	WNW.	Oct.	42	SW.	Oct.	36	W.	Sept.	18	N.	Sept.
Cheyenne, Wyo	10	36	NE.	Nov.	31	W.	Nov.	31	NW.	Nov.	37	WSW.	Sept.	9	WNW.	Oct.
Chicago, Ill	10	26	SW.	Nov.	30	W.	Sept.	43	WNW.	Sept.	20	WNW.	Oct.	[1]		
Cincinnati, Ohio	5	14	WNW.	Oct.	7	NNW.	Sept.	12	NNE.	Sept.	14	N.	Sept.	18	NNW.	Sept.
Cleveland, Ohio	10	26	W.	Oct.	28	SW.	Sept.	21	N.	Sept.	16	NW.	Sept.	14	WSW.	Sept.
Columbus, Ohio	5	28	N.	Nov.	25	N.	Oct.	30	NNE.	Sept.	[1]			[1]		
Dallas, Tex	6	38	NW.	Nov.	47	W.	Nov.	31	WSW.	Oct.	30	NNE.	Nov.	16	NNW.	Sept.
Davenport, Iowa	10	31	NNW.	Oct.	28	WNW.	Sept.	27	NNE.	Oct.	17	N.	Sept.	[1]		
Del Rio, Tex	5	21	WSW.	Nov.	29	WSW.	Oct.	28	ENE.	Sept.	12	NW.	Sept.	11	SSW.	Sept.
Denver, Colo	17	44	W.	Oct.	33	NNW.	Oct.	35	W.	Sept.	26	N.	Oct.	21	NW.	Sept.
Detroit, Mich	10	32	NNW.	Oct.	26	NNW.	Sept.	34	NNW.	Oct.	22	SW.	Sept.	[1]		
Due West, S. C	11	48	NW.	Nov.	44	W.	Nov.	59	WNW.	Nov.	39	W.	Nov.	24	W.	Oct.
Elko, Nev	4	31	S.	Sept.	18	NW.	Oct.	[1]			[1]			[1]		
Ellendale, N. Dak	13	50	NNW.	Nov.	62	NW.	Oct.	35	W.	Oct.	31	WNW.	Oct.	19	WNW.	Nov.
El Paso, Tex	4	39	SW.	Nov.	46	W.	Nov.	50	NW.	Nov.	33	WNW.	Oct.	[1]		
Evansville, Ind	7	27	WNW.	Oct.	28	WSW.	Nov.	18	NW.	Sept.	30	NW.	Sept.	46	WSW.	Sept.
Fargo, N. Dak	2	33	WNW.	Oct.	20	NW.	Sept.	[1]			[1]			[1]		
Fresno, Calif	7	31	NNE.	Nov.	32	WSW.	Nov.	[1]			[1]			[1]		
Greensboro, N. C	8	41	W.	Nov.	33	NNW.	Sept.	41	SW.	Nov.	35	W.	Oct.	17	NW.	Sept.
Groesbeck, Tex	13	35	WNW.	Nov.	37	W.	Oct.	45	W.	Nov.	40	W.	Oct.	34	WSW.	Oct.
Havre, Mont	9	36	NW.	Sept.	38	SW.	Sept.	35	N.	Oct.	24	NE.	Oct.	11	WNW.	Sept.
Hollister, Calif	1	24	N.	Oct.	17	WSW.	Sept.	[1]			[1]			[1]		
Houston, Tex	5	34	W.	Nov.	30	W.	Nov.	35	W.	Nov.	20	WNW.	Sept.	[1]		
Indianapolis, Ind	4	36	NW.	Nov.	26	W.	Nov.	41	WSW.	Sept.	44	W.	Oct.	21	NW.	Sept.
Ithaca, N. Y	10	32	W.	Sept.	34	WNW.	Sept.	41	WSW.	Oct.	12	WNW.	Sept.	[1]		
Jackson, Miss	3	16	WNW.	Nov.	13	WNW.	Sept.	10	W.	Sept.	4	NW.	Sept.	[1]		
Jacksonville, Fla	10	32	NW.	Oct.	35	W.	Oct.	37	WSW.	Oct.	26	NNE.	Oct.	26	SW.	Oct.
Kansas City, Mo	10	26	W.	Sept.	27	W.	Oct.	17	W.	Sept.	29	WSW.	Sept.	2	SE.	Sept.
Key West, Fla	16	24	W.	Nov.	34	WNW.	Nov.	27	W.	Nov.	29	W.	Oct.	21	ESE.	Sept.
Kingman, Ariz	1	39	NNW.	Nov.	31	W.	Nov.	[1]			[1]			[1]		
Knoxville, Tenn	9	32	NNW.	Sept.	35	NW.	Nov.	25	WNW.	Oct.	28	NNE.	Oct.	16	NE.	Oct.
Kylertown, Pa	1	20	W.	Oct.	18	NNW.	Oct.	[1]			[1]			[1]		
Lansing, Mich	7	39	WNW.	Sept.	34	NW.	Nov.	40	WNW.	Sept.	25	NW.	Sept.	27	WNW.	Oct.
Las Vegas, Nev	1	50	SSW.	Sept.	42	W.	Oct.	44	WSW.	Oct.	[1]			[1]		
Lebec, Calif	3	41	NNE.	Nov.	17	NNW.	Oct.	6	SSW.	Oct.	[1]			[1]		
Leesburg, Ga	2	28	WNW.	Nov.	28	WNW.	Nov.	42	WNW.	Nov.	27	W.	Sept.	21	W.	Sept.
Los Angeles, Calif	10	31	W.	Sept.	49	WSW.	Sept.	28	SW.	Sept.	22	WSW.	Sept.	21	NNE.	Nov.
Madison, Wis	8	47	NW.	Nov.	58	NW.	Nov.	25	W.	Sept.	16	ENE.	Sept.	14	SSE.	Sept.
Medford, Oreg	10	44	NNE.	Oct.	29	NE.	Sept.	35	E.	Sept.	24	W.	Oct.	5	SW.	Sept.
Memphis, Tenn	13	27	WNW.	Oct.	26	NNW.	Nov.	22	NE.	Sept.	31	W.	Oct.	14	WNW.	Oct.
Miami, Fla	6	33	W.	Nov.	23	W.	Nov.	28	WNW.	Nov.	15	W.	Sept.	[1]		
Missoula, Mont	1	20	NNE.	Nov.	23	SSW.	Nov.	20	WNW.	Nov.	[1]			[1]		
Modena, Utah	9	40	NNW.	Nov.	36	NE.	Nov.	48	W.	Oct.	38	WNW.	Nov.	42	ESE.	Oct.
Murfreesboro, Tenn	3	30	W.	Oct.	25	WSW.	Sept.	23	NW.	Sept.	7	ESE.	Oct.	7	E.	Oct.
Newark, N. J	10	25	WSW.	Sept.	21	WSW.	Sept.	25	W.	Sept.	16	W.	Oct.	24	W.	Oct.
New Orleans, La	10	32	W.	Nov.	27	WNW.	Nov.	37	WSW.	Oct.	40	WSW.	Oct.	34	WSW.	Oct.
North Platte, Nebr	6	37	NNW.	Nov.	30	WNW.	Nov.	33	E.	Oct.	22	WSW.	Oct.	28	SE.	Oct.
Northport, Wash	1	22	ENE.	Sept.	16	ENE.	Sept.	9	NW.	Oct.	[1]			[1]		
Oklahoma City, Okla	10	30	NNW.	Nov.	33	WNW.	Sept.	12	NNE.	Oct.	16	SW.	Oct.	26	NNW.	Oct.
Omaha, Nebr	16	39	WNW.	Oct.	38	WSW.	Nov.	38	W.	Sept.	28	SW.	Sept.	23	N.	Oct.
Pasco, Wash	4	26	W.	Nov.	16	NW.	Nov.	12	NW.	Nov.	[1]			[1]		
Pembina, N. Dak	3	35	WNW.	Oct.	24	NW.	Sept.	[1]			[1]			[1]		
Pendleton, Oreg	1	28	NNE.	Oct.	[1]			[1]			[1]			[1]		
Phoenix, Ariz	6	37	NW.	Nov.	29	WSW.	Oct.	28	W.	Oct.	[1]			[1]		
Pittsburgh, Pa	3	34	WNW.	Nov.	21	WNW.	Sept.	12	SW.	Sept.	[1]			[1]		
Portland, Oreg	8	33	WNW.	Nov.	32	W.	Oct.	27	NW.	Oct.	16	SW.	Nov.	24	N.	Nov.
Redding, Calif	7	48	NW.	Oct.	43	NW.	Nov.	37	NW.	Nov.	33	NNW.	Nov.	27	NNW.	Sept.
Reno, Nev	9	48	NNE.	Nov.	45	NW.	Nov.	26	SSE.	Nov.	22	WSW.	Nov.	[1]		
Richmond, Va	3	23	W.	Oct.	13	NNW.	Oct.	[1]			[1]			[1]		
Rock Springs, Wyo	4	44	SSW.	Oct.	50	NW.	Nov.	25	NW.	Nov.	31	NW.	Nov.	30	WNW.	Nov.
Royal Center, Ind	13	53	W.	Nov.	48	W.	Oct.	39	NNW.	Sept.	40	WNW.	Sept.	20	NW.	Sept.
St. Louis, Mo	10	25	NW.	Oct.	17	NNW.	Oct.	23	WNW.	Oct.	14	NNE.	Oct.	[1]		
St. Paul, Minn	10	26	W.	Sept.	30	WNW.	Sept.	23	WNW.	Sept.	28	WSW.	Nov.	[1]		
Salt Lake City, Utah	10	41	SSW.	Sept.	32	WSW.	Nov.	36	WSW.	Sept.	36	NE.	Oct.	16	W.	Sept.
Sandberg, Calif	4	39	W.	Sept.	33	WSW.	Oct.	38	WSW.	Nov.	[1]			[1]		
San Diego, Calif	5	28	WSW.	Sept.	42	WSW.	Oct.	50	WSW.	Oct.	31	WNW.	Oct.	23	SSE.	Oct.
San Francisco, Calif	15	47	NNW.	Nov.	29	W.	Oct.	34	SW.	Nov.	31	WNW.	Oct.	28	NW.	Nov.
Sault Ste. Marie, Mich	10	30	NNW.	Sept.	30	WNW.	Oct.	28	NNW.	Sept.	23	NW.	Sept.	45	NW.	Sept.
Seattle, Wash	10	46	NW.	Nov.	24	W.	Oct.	28	WNW.	Sept.	13	NW.	Sept.	6	WNW.	Oct.
Sheridan, Wyo	7	57	WSW.	Oct.	38	W.	Sept.	38	N.	Nov.	24	NNE.	Nov.	10	WNW.	Sept.
Spartanburg, S. C	4	22	WNW.	Nov.	25	NW.	Nov.	28	WNW.	Oct.	31	N.	Sept.	12	NNW.	Oct.
Spokane, Wash	10	48	W.	Sept.	47	NW.	Nov.	26	NNE.	Sept.	16	NW.	Sept.	[1]		
Tampa, Fla	5	22	WSW.	Oct.	20	W.	Nov.	22	SW.	Sept.	24	WNW.	Nov.	9	ENE.	Sept.
Tucson, Ariz	1	[1]			[1]			[1]			[1]			[1]		
Tulsa, Okla	2	29	NW.	Oct.	16	WSW.	Nov.	17	N.	Nov.	16	NW.	Nov.	15	NNW.	Nov.
Vicksburg, Miss	1	25	WNW.	Nov.	25	WNW.	Nov.	25	WNW.	Nov.	18	WNW.	Nov.	[1]		
Washington, D. C	18	37	W.	Nov.	36	WSW.	Oct.	36	W.	Sept.	33	WNW.	Nov.	16	NNW.	Sept.
Wichita, Kans	6	36	WNW.	Oct.	44	W.	Oct.	40	NE.	Sept.	26	WSW.	Sept.	22	E.	Sept.
Winnemucca, Nev	11	[1]			[1]			[1]			[1]			[1]		
Winslow, Ariz	5	68	WNW.	Nov.	43	NW.	Nov.	34	W.	Nov.	45	N.	Nov.	38	W.	Nov.
Yakima, Wash	1	23	NW.	Nov.	15	W.	Oct.	9	WNW.	Oct.	7	N.	Oct.	[1]		

[1] No data available for these levels.